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A case study in natural resource policy: Yellowstone cutthroat trout (Oncorhynchus clarki bouvieri) in the Greater Yellowstone ecosystem

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A CASE STUDY IN NATURAL RESOURCE POLICY: YELLOWSTONE CUTTHROAT TROUT (*Oncorhynchus clarki bouvieri*) IN THE GREATER YELLOWSTONE ECOSYSTEM

BY

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THESIS

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Date

DEDICATION

For my grandparents who forged my lifelong bond with nature during our visits to Rubyat, the family cabin.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

FIGURE PAGE

LIST OF ABBREVIATIONS

ACF ..... Advocacy coalition framework
BLM ..... Bureau of Land Management
BoR ..... Bureau of Reclamation
CBD ..... Center for Biological Diversity
CCAA ..... Candidate Conservation Agreement with Assurances
CPR ..... common pool resource
EA ..... Ecosystem Approach
ESA ..... Endangered Species Act
FLMA ..... Forest Land Management Act
FWS ..... U.S. Fish and Wildlife Service
GYE ..... Greater Yellowstone Ecosystem
IAD ..... Institutional Analysis and Development framework
IFG ..... Idaho Fish and Game
IMA ..... Idaho Mining Association
IRC ..... Institutional Rational Choice framework
MoA ..... Memorandum of Agreement
MTFWP ..... Montana Fish, Wildlife & Parks
NEDC ..... Northwest Environmental Defense Center
NEPA ..... National Environmental Policy Act
NGO ..... non-governmental organization
NMFS ..... National Marine Fisheries Service
NPS ..... National Park Service
PCF ..... Political Contracting framework
RPA ..... Forest and Rangelands Renewable Resource Act
SCF ..... Social Capital framework
USFS ..... U.S. Forest Service
YCT ..... Yellowstone cutthroat trout
YNP ..... Yellowstone National Park

ABSTRACT

A CASE STUDY IN NATURAL RESOURCE POLICY:

YELLOWSTONE CUTTHROAT TROUT (*Oncorhynchus clarki bourvieri*) IN THE

GREATER YELLOWSTONE ECOSYSTEM

BY

BRAD JOHNSON

University of New Hampshire, May, 2007

The Greater Yellowstone Ecosystem is hailed as one of the most intact temperate ecosystems in the world. Within the ecosystem the Yellowstone cutthroat trout has been noted as both a keystone species and an indicator of ecosystem health. As anthropogenic induced stress and its effects on natural systems have become more readily apparent, a call has risen for a new holistic form of natural resource policy development and implementation. The Ecosystem Approach, based on the principles of sustainability, is a multidisciplinary, cross-sectoral policy paradigm, which serves that function for this study.

This research analyzed the extent to which natural resource policy in the Greater Yellowstone Ecosystem has transitioned from a traditional reductionist approach to an Ecosystem Approach based on the case study of Yellowstone cutthroat trout. The case study is based on empirical evidence gathered through interviews with state, federal, and non-governmental officials in the Greater Yellowstone and public comments submitted for a twelve-month status review pertaining to the petition to list the Yellowstone cutthroat trout under the Endangered Species Act. Two bodies of theory have been

engaged in this study. The first is the theoretical criteria of the Ecosystem Approach, while the second is the Advocacy Coalition Framework that has been utilized as the policy analysis framework for the study.

This research concluded that Yellowstone cutthroat trout policy is interrelated with numerous other sector of policy to include, public land management, private property rights, economics, demographics, and a multitude of debates that surround each. While Yellowstone cutthroat trout policy influences, and is influenced by, a number of factors, transition from a traditional approach to an Ecosystem Approach to natural resource policy development and implementation has been severely limited. The limitations of the transition, as reflected in the case study, stem from a lack of, overarching ecosystem-wide goals, inter-agency cooperation, public involvement and education, and the continued effects of historical policies.

CHAPTER I

RESEARCHING NATURAL RESOURCE POLICY IN THE GREATER YELLOWSTONE ECOSYSTEM

Introduction

The Greater Yellowstone Ecosystem is said to be "one of the last, essentially intact, temperate zone ecosystems on the planet" (Barbee and Varley, 1984 from Glick and Clark, 1998) including a fully intact food web following the reintroduction of the gray wolf in the mid-1990s. The ecosystem takes its name from the national park found at its core. Like the national park, the larger ecosystem, its components, and its policies are subject to increasing levels of conflict. The focus of much of the conflict and resulting media coverage surrounds the charismatic mega-fauna that are so prevalent in the ecosystem, to include the grizzly bear, gray wolf, moose, elk, and bald eagles, just to name a few. Not as widely covered, but well known to many, is the native trout of Yellowstone National Park (YNP) and the Greater Yellowstone Ecosystem (GYE)- the Yellowstone cutthroat trout (YCT).

This research is based on an examination of policy and management surrounding the Yellowstone cutthroat trout, one of fourteen native cutthroat trout subspecies in the western United States (Behnke, 1992). The YCT is a keystone species within the Greater Yellowstone Ecosystem, that is to say a species that has ties up and down the ecological ladder whose dramatic reduction or extirpation would likely produce a multitude of cascading consequences throughout the ecosystem.

The threats to the species and the cascading consequences of policy-making and management are largely the same for the YCT as other cutthroat trout subspecies found throughout the western U.S. As such, policy influences and outcomes regarding the YCT may be representative of the various issues and conflicts that influence native trout policy throughout the Mountain West.

The issues to be explored in this research include the outcomes produced through the traditional approach to natural resource policy, which will be contrasted with the holistic policy paradigm of the Ecosystem Approach (EA). Included in the debate between the traditional and Ecosystem Approach is an evaluation of stakeholder involvement in the development of natural resource policy. Finally, the evolution of Yellowstone cutthroat trout policy in the Greater Yellowstone Ecosystem provides the case study for an in-depth analysis of natural resource policy making and the implications of past and current policy and management decisions in the GYE. The relevance in pursuing the issues identified above lie in providing the context in which social, political, economic, and natural systems overlap producing conflict and eventually policy.

This study seeks to explore natural resource policy-making in a manner that accounts not only for the outcomes of the policy-making process, but also the mechanisms that give rise to the observed outcomes. To accomplish this the research requires a theoretical paradigm that moves beyond the study of institutions and interactions to a robust framework that examines causal mechanism that are often 'black boxed' in the examination of the policy process. The advocacy coalition framework established by Sabatier and Jenkins-Smith (1993) provides a framework that addresses the intergovernmental policy-making apparatus and it's causal mechanisms through the

lens of policy change and learning. The mechanisms provided through the ACF establish a framework by which empirical policy analysis may take place.

The current state of natural resources, at any scale, demonstrate the need for a new model of natural resource policy-making. The Ecosystem Approach offers a holistic framework for the development of environmental policy that includes the human components of the system. The Ecosystem Approach requires that stakeholders at all levels, especially the local grassroots public, be included in what has historically been a policy apparatus dominated by technical experts and elites. This study will observe the extent to which an Ecosystem Approach to natural resource management, through the context of the Yellowstone cutthroat trout, has been recognized in the Greater Yellowstone Ecosystem. The ACF will serve to highlight the interactions of the stakeholders as policy change takes place in the GYE within the context of the Ecosystem Approach. The analysis of natural resource policy-making focuses on the policy and management of Yellowstone cutthroat trout in the Greater Yellowstone Ecosystem beginning with the discovery of lake trout in Yellowstone Lake in 1994.

Understanding The Problem

The Yellowstone cutthroat trout is the signature native fish species of Yellowstone National Park. It is also a keystone species of the Greater Yellowstone Ecosystem and an economic powerhouse for the sport fishing industry in and around the National Park. Named for its native range and the red-orange slash found beneath the jaw, the native trout of the GYE is in trouble. Table 1-1 affirms this notion by noting the concern for the subspecies among both state and federal agencies.

The native trout of the GYE resides in an array of habitat conditions that run from small streams to large rivers and small, shallow ponds to the enormous Yellowstone Lake. While the size of the waterway can vary greatly, what the fish do require for survival is cold, clean, clear water (Varley & Schullery, 1998). Something that over time has become scarce in the ecosystem as development claims more and more habitat, which has led to fragmentation of YCT populations into mountain lakes and headwater streams. The subspecies inhabits watersheds on both sides of the Continental Divide. They can be found throughout the Snake River and Yellowstone River watersheds that eventually feed into the Columbia and Missouri Rivers respectively.

Table 1-1: State and Federal Yellowstone Cutthroat Trout Designation

- Idaho- Imperiled
- Montana- Species of Concern
- Wyoming- Species of Greatest Conservation Need
- Bureau of Land Management- Imperiled
- Forest Service- Sensitive
- Fish and Wildlife Service- Petitioned Candidate[1]

[1]The petition to list the Yellowstone cutthroat trout was found 'not warranted' by the U.S. Fish and Wildlife Service on February 21, 2006. The final decision can be found posted in the *Federal Register volume 71, number 34.*

In the waters in which they are found, the Yellowstone cutthroat trout serve as a food source for a diverse array of bird and mammal species. It is believed that the native trout serves as a food source for up to forty-two different species to include the apex predators of the ecosystem, the black bear and the grizzly bear (Schullery & Varley, 1995; Varley & Schullery, 1998). Serving as a food source for a broad assortment of species within the ecosystem, the native trout plays a key role in transporting biomass between the aquatic and terrestrial components of the ecosystem (Bigelow, Koel, Mahony, Ertel, Rowdon, and Olliff, 2003). With its linkages throughout the food web and both the aquatic and terrestrial components of the ecosystem, this seemingly

innocuous native trout and the threats to its survival reveal threats to the health and sustainability of the ecosystem itself.

Like so many ecosystems, the Greater Yellowstone has no shortage of threats to its overall health or the individual components found within. What makes the plight of the Yellowstone cutthroat trout within the context of the GYE and the obvious concern of state and federal agencies poignant, is the potential for cascading consequences throughout the ecosystem in the event of the decimation or extirpation of the subspecies.

As devastating as the ecological viability of the Yellowstone cutthroat trout subspecies stands to be for the GYE, there exists another compelling purpose in examining the policy surrounding the trout. The threats to other subspecies of cutthroat trout found throughout the western United States are much the same as that of the YCT. The case of the Yellowstone cutthroat trout reflects many of the same threats and potential consequences based on the development and implementation of natural resource policy of other native trout. Therefore examining YCT in the context of the ecosystem may reveal significant policy mechanisms for the ecosystems in which other cutthroat trout subspecies are found.

Where the Trouble Doesn't Begin

In July of 1994 it was discovered that the "last great refuge" of Yellowstone cutthroat trout, the "stronghold" of the subspecies' survival, Yellowstone Lake, had been breached. An angler on a guided fishing trip had caught a lake trout in Yellowstone Lake. Recognizing that lake trout do not naturally occur in Yellowstone Lake the guide contacted Park Service employees and revealed what would later be termed a threat to the health of the ecosystem (Varley and Schullery, 1995).

Although the discovery of lake trout in Yellowstone Lake in 1994 serves as the temporal benchmark for this research on Yellowstone cutthroat trout policy in the Greater Yellowstone ecosystem, it is not the first, nor likely, the greatest threat to the survival of Yellowstone cutthroat trout subspecies. The case study of Yellowstone cutthroat trout policy found in chapter four reveals a set of historical and contemporary threats to the YCT subspecies beyond the discovery of lake trout. For the purpose of this research the 1994 discovery serves as the focal point in the policy subsystem of the Yellowstone cutthroat trout in the Greater Yellowstone Ecosystem.

The Trouble with Niches

At the time of the lake trout discovery it was believed that as long as Yellowstone Lake survived to serve as a bastion for the Yellowstone cutthroat trout then the subspecies as a whole would not face the threat of extinction. Unfortunately, the threat posed by lake trout to the survival of the YCT found in Yellowstone Lake is only a single factor in an already taxed ecosystem. But this particular threat to the YCT subspecies and the larger ecosystem serve as a perverse example of the interconnections of ecosystem components, functions, and health. The two different species, lake trout and Yellowstone cutthroat trout, occupy two distinctly different niches; niches that are not compatible within the Greater Yellowstone Ecosystem. Why this is the case is addressed below.

Yellowstone Cutthroat Trout (*Oncorhynchus clarki bouvieri*). The Yellowstone Lake population of Yellowstone cutthroat trout are adfluvial and move from the lake into the tributaries of Yellowstone Lake to spawn. The YCT spawning runs serve as a ready source of food for numerous bird and mammal species within Yellowstone National Park

(Scullery & Varley, 1995). The spawning run also serves as a vital link for the transfer of biomass and nutrients from the aquatic to the terrestrial component of the ecosystem surrounding Yellowstone Lake (Bigelow, et al, 2003).

A single lake trout can consume up to 41 Yellowstone cutthroat annually (Ruzycki et al. 2003 from Bigelow et al. 2003).The decline of Yellowstone Lake's cutthroat population is the result of predation by the introduced lake trout. The effects of the predation have become evident in the reduced spawning runs. The effects of reduced spawning runs as a result of predation produced cascading ecological effects. Bear activity along tributaries of Yellowstone Lake has decreased in line with reduced Yellowstone cutthroat spawning runs. The effects of this single connection are not yet known, but it is likely that this will not be the last interconnection affected by the introduction of non-native lake trout into the habitat of Yellowstone cutthroat trout.

Lake Trout (*Salvelinus namaycush*). In contrast to the adfluvial population of Yellowstone cutthroat trout found in Yellowstone Lake, the introduced lake trout spend their entire life cycle within the lake itself. In addition, lake trout typically inhabit deeper waters of Yellowstone Lake, denying the species as a food source to most predator species in the system (Bigelow et al. 2003).

Yellowstone cutthroat trout and lake trout occupy two separate and non-overlapping niches in Yellowstone Lake. Coupled with the predation of Yellowstone cutthroat by lake trout the outcome has and will continue to produce effects throughout the ecosystem beyond simply Yellowstone Lake.

Yellowstone Lake is only a portion of the Greater Yellowstone Ecosystem, but it is a significant portion. Until the discover of lake trout in 1994 it was believed to be the

stronghold for the survival of the Yellowstone cutthroat trout subspecies. Since the discovery the interconnection between components of the Greater Yellowstone Ecosystem, aquatic and terrestrial, have been starkly laid bare. The plight of the Yellowstone cutthroat trout in Yellowstone Lake highlight the importance of the YCT in the larger ecosystem and the cascading consequences of anthropogenic manipulation of the system. But it must be understood that Yellowstone Lake is only a portion of the overall ecosystem. Yellowstone cutthroat trout, as a subspecies, suffer from a number of threats throughout the entirety of their range within the GYE beyond Yellowstone Lake.

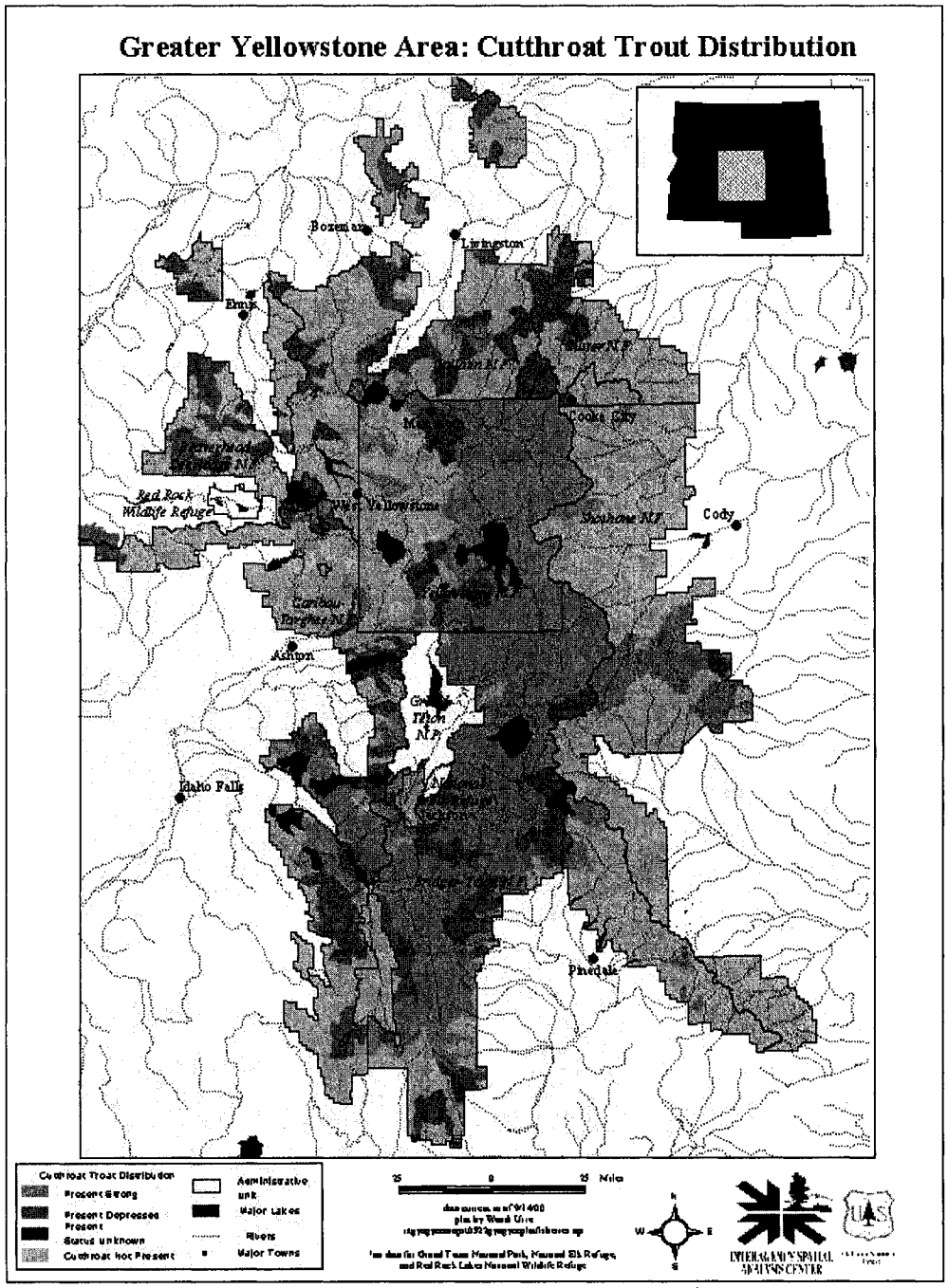
For all the damage that has been done within Yellowstone Lake, much of the historical habitat of the YCT is not afforded the protections found within Yellowstone National Park. Therefore it is imperative to examine the subspecies throughout the Greater Yellowstone Ecosystem through the context of policy development and implementation as a whole. The following section will layout the methodology used in this study to examine YCT policy in the Greater Yellowstone Ecosystem.

Research Methods

The qualitative attributes of the case study methodology provide a number of benefits to this particular piece of research beyond what is offered through quantitative methods. Case studies provide a richness of explanation within an identified historical context that, while potentially limited to broad generalization, reveal what may be otherwise unidentified catalysts or causal mechanisms. Process-tracing, the observation of links in policy-making causes and outcomes, throughout the period of the case study provide empirically observable outcome. Process-tracing within a case study expands the research to address a temporal or longitudinal dimension of the study as the causal

mechanisms of the policy-making processes are revealed. This process allows for the subsequent development of conceptual refinement through the examination of a small number of cases (George and Bennett, 2005).

Figure 1: GYCC Map of Cutthroat Trout Distribution



Source: Greater Yellowstone Coordinating Committee, Greater Yellowstone Area: Cutthroat Trout Distribution, http://bsi.montana.edu/web/gycc/files/gycc/images/gyagyccfisheries8511old.jpg.

Approach

In order to develop the empirical data required to effectively institute process-tracing, personal interviews with state and federal management agency officials and NGO representatives active in shaping Yellowstone cutthroat policy were undertaken in the summer of 2006. A total of ten interviews were conducted in support of this research[1]. The selection of interviewees was based on a number of criteria to include, holding a past or present position in an agencies that actively develops YCT policy, involvement in shaping policy outside of management agencies through litigation, the expressed concern of an organization over YCT policy, and recommendations for inclusion by other interviewees[2]. In addition to interviews, qualitative data were collected through the use of literature, which includes peer-reviewed writings, management agency documents, pubic comments, and court cases.

Interviews with each individual were semi-structured and based on questions that were derived from the hypothesis statements on which this research is based[3]. Interviews were conducted in person or via telephone and were recorded with the permission of each interviewee for later transcription. Following transcription each interview was hand coded by the author. The coding of transcripts were based on the codes identified in Table 1-2. The coding was conducted in order to provide empirical evidence for the case study in chapter four. Both direct quotes and summaries of specific information are provided within the context of the case study and are a reflection of support for one or more hypothesis statements.

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[1] A list of interviewees can be found under Appendix A.
[2] Interviews were conducted only after receiving written approval from the University of New Hampshire Institutional Review Board. A copy of written approval may be found under Appendix B.
[3] The hypothesis statements for this research are found in chapter three.

Table 1-2: Interview Coding Scheme

ESA Listing	Wilderness/ Roadless
Stakeholder Involvement	Agency Cooperation
Public Lands	Non-native Competition
Private Property	Hybridization
Public Education	Stocking
Native vs. Wild	Other Threats

Public comments that were submitted to the Fish and Wildlife Service in support of the twelve-month status review of the Yellowstone cutthroat trout were also used as empirical evidence for this study. Public comments were coded as either (1) in support of an ESA listing or (2) opposed to an ESA listing. The coding allowed those entities that submitted the comments to be listed in one of the two advocacy coalitions found in chapter four Table 4-1. Comments that specifically withheld a position or in which the position was unclear were omitted from inclusion in an advocacy coalition. Finally, public comments were cited within the case study to provide empirical evidence with regards to specific hypothesis statements.

Limitations

While case studies offer a number of benefits, such as the empirical analysis provided through process-tracing, the methodology is not without its weaknesses. One of the greatest weaknesses of case study methods are the lack of generalization to the broader universe of policy-making beyond the case study. A second noted weakness of the methodology are the limits attributed to a small number of cases upon which a case study is derived, which in turn, again leads many to the justified complaint of limited generalization. A third weakness is the selection of cases on the dependant variable. Selection bias has been shown to produce uncorrelated results (Geddes, 1990) and therefore stands to be a substantial flaw in the case study methodology.

No methodology is without its flaws or weakness. This research will relies on the theoretical framework of the study in order to help expose flaws within the case study methodology through the examination of causal mechanisms over time. By laying bare the underlying processes and mechanisms that drive policy-making in the case study, the methods by which outcomes are produces will be exposed in a manner that will allow others to identify and evaluate both the process of policy-making in the study. The theoretical framework used for this study contains within it a process that itself exposes causal mechanisms for empirical evaluation, which will be fully explored in chapter three.

It is important to identify both the strengths and weaknesses of their chosen methodology, but it is equally important for researchers to be upfront with their own biases that may somehow influence the study. The current condition of natural resource in the Greater Yellowstone Ecosystem, while undeniably better than many ecosystems, has suffered decline through the years from a number of drivers, to include the traditional policy-making and management apparatus. Scientific research and assessment from a variety of fields has recognized the need for a change of course to one that ultimately leads to sustainability. With this in mind it is the goal of this research to examine the extent to which sustainability is currently a driving force in the ecosystem through an application of the Ecosystem Approach criteria to policy-making. These concerns have driven this research on natural-resource policy-making in the GYE and the desire to see the process not only improved, but become inclusive to an extent currently unknown in the ecosystem and the region.

Regarding the composition of the coalitions used in the advocacy coalition framework- this research has not been undertaken to place a value judgment on either coalition or to further one argument over the other. Instead, the research should reveal strengths and weaknesses of each along with the substantive outcomes and implications.

Research Questions

The purpose of this research is to provide policy-makers and academics with research that identifies the causal mechanisms of natural resource policy-making in the Greater Yellowstone Ecosystem. The means to achieve the desired outcome is through an examination of a specific case of policy-making in order to provide explanations, correlations, and recommendations derived from therein. The following research questions have acted as the guide to the development of the hypothesis statements found in chapter three.

The first research question to arise from a review of the historical narrative of the Yellowstone cutthroat trout was to what extent has the Endangered Species Act influenced policy-making, policy learning, and management of the native trout? Second, considering the range of the trout throughout five states, but specifically within its range in the Greater Yellowstone Ecosystem (Idaho, Montana, and Wyoming), what role has federal public lands and private property had in influencing policy-making for the native fish? Third, how inclusive has the policy-making process been for this specific case? Finally, to what extent has the Ecosystem Approach to natural resource policy been applied to the Yellowstone cutthroat trout? While this may appears as a large number of research questions to be addressed, they are in many ways interconnected. This requires

that each be addressed discreetly while at the same time accounting for all others, producing a holistic view of the policy process.

Conclusion

The case study of the Yellowstone cutthroat trout in the Greater Yellowstone Ecosystem serves as an active example of conflicts that influence natural resource policy-making. As a member of the cutthroat trout family, the YCT is a subspecies of inland cutthroat trout found throughout the Mountain and Pacific West, of which nearly all are experiencing the same synergistic threats to survival as a species. The role of public and private lands, an important and divisive debate throughout Mountain West, are entwined in the management of the fish, which includes the intra and inter-agency conflicts of federal land management agencies. The changing economic and demographic profile of the Mountain West may also prove to influence the policy and management of the native trout. The YCT has been the subject of a petition for listing under the Endangered Species Act, which has produced a number of ramifications for the species, management agencies, private property owners, and rural communities of the GYE. As a keystone species within the Greater Yellowstone Ecosystem, the YCT is intertwined with debates over policy of a diverse number of other species to include the contentious grizzly bear of the GYE. Finally, the range of the native trout allows for the examination of ecosystem wide policy of the subspecies, something which has garnered considerable attention as there has been a call to move away from a reductionist style of policy-making and management to one that is holistic in scope and inclusive in its undertakings.

To sum up, the case study serves two broad purposes. First, the Yellowstone cutthroat trout may serve as a test for native fish policy in the Mountain West to include

the conflicts that surround policy-making. Second, the range of the native trout within the Greater Yellowstone Ecosystem serves to provide an illustration of the extent to which an Ecosystem Approach has, or has not, been broadly developed or applied. Both attributes are broad and appear to offer tremendous potential for answering problems associated with wildlife policy-making, but one must be careful in generalizing the results of the case study. Inferences may be derived from the results of the research that may serve policy-makers and researchers alike in attempts to answer further research questions or craft future policy.

Using qualitative analysis, this research is designed to examine a number of hypothesis statements concerning natural resource policy in the Greater Yellowstone Ecosystem. A case study of Yellowstone cutthroat trout policy and management provides the basis for this study, which includes data collected through interviews and the review of literature surrounding YCT policy.

The issues, concerns, and conflicts that surround Yellowstone cutthroat trout policy, while limited in scope, are considered by fishery management professionals to be representative of the larger issues of inland cutthroat trout management in the inland West.

The remainder of the thesis and the case study on which it is based are as follows. Chapter two contains the literature review and contextual mapping that examines the broad linkages between natural resource policy in the United States and the more specific Yellowstone cutthroat trout policy, refining throughout the chapter the scope of the argument to specific debates and conflicts that influence natural resource and wildlife policy in the Greater Yellowstone Ecosystem. Chapter three lays out the theoretical

framework for the case study providing the criteria for an Ecosystem Approach to natural resource policy and the advocacy coalition framework and includes a number of hypothesis statements. Chapter four contains the case study of policy learning surrounding Yellowstone cutthroat trout in the Greater Yellowstone Ecosystem. Finally, chapter five provides conclusions from the findings in chapter four followed by a set of recommendations.

CHAPTER II

ISSUES IN WESTERN NATURAL RESOURCE POLICY

Introduction

The study of natural resource policy, policy-making, and policy learning take place on several different, but interconnected levels. Natural resource policy learning in the Greater Yellowstone Ecosystem requires more than a simple examination of national or even regional debates over natural resources. Understanding the dynamics of something as broad as natural resource policy in the Greater Yellowstone Ecosystem requires a review and understanding of the linkages, interconnections, and catalyzing effects of not only national natural resource policy debates, but federal wildlife policy and law, public lands policy and management, conflicts between different levels of government, property rights, and finally, regional historical context including the role of the economy and demographics. The majority of this chapter has been developed to introduce the reader to many of the drivers of natural resource conflict before delving into the more specific elements of natural resource policy in the GYE.

The purpose of this chapter is to establish the framework for the contextual mapping of policy-making in the GYE. Within the Greater Yellowstone Ecosystem, ecological and policy environments overlap, requiring policy makers and managers to account for a broad array of concerns, conflicts, and policy-driven consequences.

The development and implementation of Yellowstone cutthroat trout policy influences, and is influenced by, the issues outlined within this chapter. It is in this complex social, political, and ecological environment that policy for Yellowstone cutthroat trout is crafted. Chapter four will demonstrate more directly the influences of the issues outlined within this chapter.

Many issues influence the development of natural resource policy in the Greater Yellowstone Ecosystem. The chapter begins by outlining the values and beliefs of two prominent factions whose values often lead to conflict, which is followed by a review of federal and state mandates for the establishment of wildlife policy, this sets the stage for a review of wildlife policy on public lands. The authority granted over wildlife that is split between federal and state governments sets the stage for a range of conflicts, as will be seen throughout this chapter and the thesis. The section on wilderness and roadless areas is an explicit policy debate regarding public lands, a debate that has ramifications for both wildlife species and their habitat and rural communities and often their economies. The discussion of wilderness and roadless areas is followed by a section on rural communities and their economic ties to public lands, to include their dependence on public land policy for economic stability through natural resource extractive industries. The discussions of each issue culminates at the end of the chapter with the contextual mapping of the Greater Yellowstone Ecosystem and the natural, social, economic, and political influences that influence natural resource policy. Each section is developed to provide the reader a general introduction to the various factors that influence natural resource policy in the GYE that, in turn, relate to this research.

The Greater Yellowstone Ecosystem possesses deeply engrained connections between rural communities, resource extractive industry, public lands, and environmental concern. These interconnections have produced scholarly debates attempting to identifying to what extent the connections hold true and how changes in one component influences natural resource policy in another component. This chapter examines just a few of these debates. The chapter begins by examining the values associated with different stakeholder groups in relation to natural resource policy at its broadest level, the national level, then reduce the scope of the debate throughout the chapter as the linkages between each level and the other components are identified and developed.

Values, Beliefs, and Natural Resource Policy

It has become standard in environmental policy literature to divide actors involved in natural resource policy into two distinct categories for evaluation and analysis. In this model the different sides of the dichotomy are given a variety of different monikers, but usually reflect one of the following: the preservationists and the growth advocates (Lowry, 2000) or the environmentalists and the cornucopian's (Layzar, 2006). However split, the two groups are divided into a preservation oriented and utilitarian dichotomy. While this split is overly simple, in the broad context it becomes a useful tool when viewing natural resource policy at a number of different levels. Actors seek to turn their values, or beliefs, into policy through a variety of strategies, which will be demonstrated later in the chapter. It is therefore useful to briefly examine the values of each side of the debate.

The cornucopian, 'wise use', growth advocate groups are, generally, those who see the environment and its goods and services as potential for human benefit through

economic growth (Layzar, 2006; Lowry, 1997; Arnold, 1996). The worldview of growth advocates is one of anthrocentricity. This view of ecosystem goods and services is utilitarian in nature and those who support this worldview are often referred to as utilitarian's. They see restrictions placed on the utilization of natural resources as restrictions placed on society and its continued betterment. They tend to see the resources of the earth as boundless (Layzar, 2006) and unlimited economic gain not only as possible but beneficial (Arnold, 1997). Within this anthropocentric worldview and its economic-based values, the earth is a resilient system and any human caused problems or catastrophes will either be offset with technology or alleviated all together (Arnold, 1997; Layzar,2006). Furthermore, the role of government within this context as noted by Layzar (2006) is "to assign property rights in the earth's resources and let the markets dictate allocations of the goods and services..." These values combine to set the stage for a multitude of conflicts through a variety of vectors, including within them stakeholders from nearly every sector of society.

The preservation, conservation, environmentalist perspective has evolved into a loose conglomeration of actors with wide varying values lumped into a single category (Layzar, 2006). This group of actors see the need for restrictions to be placed on the human utilization of natural resources for a variety of different reasons from concerns over human health, to equity, to the right of species to exist for their own value of existence (Meadows, 1972; Davis, 1997a; Paelke 2000). The environmental or preservationist worldview, like the growth advocates, are diverse, but trends arise that give form to the preservationist paradigm. One of the dominant values of the environmentalist movement that has risen in the latter half of the twentieth-century is that

the goods and services of the earth are indeed finite and there must be a limit to human growth and expansion (Arnold,1996; Layzar,2006; Lowry,1997). This limit may take the form of preserving swaths of land in a 'pristine' form or the conservationist view that supports efficient and sustainable use of natural resources (Layzar, 2006). A second set of values that have risen in the contemporary environmental movement represents a reduction in the anthropocentric paradigm, to be replaced with increased valuation of natural systems and their component flora and fauna as a necessary indicator to support healthy ecosystems and by extension human health and welfare. These values find their roots in the deep ecology beliefs that other species have, at the very least, the right to continued existence within the biosphere on the basis of the very existence. This is to say that through their place in the biosphere, species possess the right to exist, perhaps beyond that of humans and their activities. This serves as the basis for an ecocentric value system (Arnold, 1996; Paelke 2000; and Layzar, 2006). Not every member or organization within the environmental movement holds the deep ecology belief, but the beliefs system of deep ecology sets the stage for the inclusion of the broader and less radical environmental movement. The underlying worldview recognizes that the health and welfare of human society depends upon the function of ecosystem goods and services, which are a reflection of ecosystem health.

The vast differences in values associated with the allocation and utilization of the scarce resources of the environment serve as the catalyst for policy learning and conflict at the broadest level of natural resource policy making in the United States. The conflicts produced through such a broad disparity in values has become exacerbated in the Western United States, in particularly the Mountain West.

Within the sphere of natural resource policy and law, wildlife policy occupies an oft-times overlapping position within the sphere. Demonstrated throughout the remainder of this chapter policy surrounding wildlife, while appearing discreet and narrow in concept is, in fact, very broad. Contentious policy debates become ill-defined as the debate surrounding a specific policy expands to include economics, sports and recreation, property rights, multiple-use vs. preservation, habitat protection, and a multitude of other issues that inevitably overlap to produce a web of policy interrelations. The remainder of the chapter will explore a number of the issues and conflicts that arise over wildlife policy and overlap with the larger field of what is typically termed 'natural resource policy'.

National Wildlife Policy

The federal government, through the Constitution, has maintained the ability to establish policy over wildlife and their habitat throughout the United States, which has been supported many times over by the Supreme Court. Bean and Rowland (1997) have traced the roots of federal authority over wildlife regulation from English Common Law (and further back) through a number of cases that have supported and articulated the federal government's authority to regulate wildlife. They have noted that through the Constitution, the powers over the regulation of interstate commerce have bestowed the federal government authority over wildlife. Additionally, the Constitutionally provided authority to make treaties and regulate property have also served to provide the federal government with the authority to establish policy over wildlife. The federal government's authority to regulate wildlife has been demonstrated through federal laws such as the Migratory Bird Act of 1913, The Wild Free Roaming Horses and Burrow Act,

and the Endangered Species Act and its amendments, to name a select few (Bean and Rowland, 1997). Federal authority over wildlife has increased dramatically with the establishment of legislation granting the federal government authority over wildlife habitat, particularly through 'critical habitat' designation under the ESA.

States also possess a strong authority over wildlife within their own borders that has also been supported and reaffirmed by the Courts. The state ownership doctrine established in the case of *Geer v. Connecticut* (Bean and Roland, 1997; Lueck, 2000) has cemented the right of individual states to manage and regulate wildlife within the state's borders. Through *Geer* the right of states to emplace regulations on wildlife and the doctrine of state ownership was sealed (Bean and Rowland, 1997). This has lead to a protracted debate over the demarcations between state and federal authority concerning wildlife policy. An important aspect that must be recognized, is that throughout the debate over federal versus state right to establish wildlife policy, it was understood that wildlife did not belong to individuals and thereby allowed the federal and state governments to establish regulations and place limits on access and utilization of wildlife (Lueck, 2000).

As wildlife policy continued to evolve throughout the United States the discussion continued to extend to the role, regulation, and management of wildlife habitat. This debate would prove to have deep and volatile consequences for the Mountain West in the end of the twentieth and early twenty-first century, especially due to the influence of public lands on rural western communities.

Wildlife Policy and Public Lands

Federal agencies attempt to establish policy within their borders, across political boundaries, and between management agencies. This has produced a disparate policy arena between the spheres of public land management and wildlife policy. The disparity arises from the crafting of policy and the implementation of management that is delineated by the political boundaries of an agency's holdings.

One third of the land in the United States is contained in public holdings of which the majority are found in the Western United States. Currently there are approximately 650 million acres of public land administered by federal agencies (Lowry,1997); Table 2-1 below provides a breakdown of federal land holdings by Mountain West states and agency. The agencies administering public lands are a diverse set of institutions whose mission and policy orientation is spread across a broad spectrum that is determined by a variety of factors including the type of land they are managing and the agencies mission as it is articulated through the executive branch, Congressional acts, and Court rulings (Davis, 1997b; Layzar, 2006). In turn, each land management agency is constrained by a group of unique mechanisms that influence the agency's policy and management of it's assets; the most recognized of which is the agencies constituency (Davis, 1997b; Layzar, 2006).

The relationship between a federal land management agency, it's constituency, and Congressional oversight bodies create a closed, fairly stable subsystem (Davis, 1997b; Layzar, 2006) that acts as a constraint against change, usually referred to an 'iron triangle'. While the closed policy system of the iron triangle is useful as a didactic mechanism, it does not support the full array of actors and issues that typically interact in

the development of wildlife policy on public lands. The movement of wildlife across political boundaries denies the iron triangle its typical closed system influence over natural resource policy. The mobility of wildlife also gives rise to turf battles between agencies, which extends the debate beyond the typical iron triangle. Turf battles take place as agencies vie for control over resources that cross political boundaries or in laying claim to resources that may be added to their own holdings. Of particular concern here are wildlife, their movements, habitat and any redistribution of administrative authority or budget that may take place as wildlife policy and law continue to evolve in the Mountain West.

Ecosystems contain a multitude of habitats, flora, and fauna that overlap and interact in a multitude of scales to produce an interconnected, interdependent system. Typically, ecosystems found in the Mountain West have been divided among federal, state, and private holdings; the concern herein is in examining the division of ecosystems by individual federal agencies, states, and private property along arbitrary borders. The overarching concern being the extent to which these borders foster conflict due to lack of an integrated policy and management scheme.

Prior to the formulation of the multiple use frameworks that currently guide the Forest Service, Bureau of Land Management (BLM), and the Bureau of Reclamation (BoR) or the preservationist framework of the National Park Service (NPS) and the Fish and Wildlife Service (FWS), public lands were largely managed for private economic benefit through the extraction of resources. Resource extraction includes logging, minerals, oil and gas development, or grazing (Davis, 1997b; Hoberg, 1997; Switzer,2004). Management of public lands has been transformed from a historical

mission of providing opportunities for economic benefit to a small constituency to a continually expanding constituency with a broad spectrum of values.

The Forest Service has transformed from an agency once dominated by its timber constituency to an agency that, through the Forest and Rangeland Renewable Resources Act (RPA) of 1974 and the National Forest Management Act (NFMA) of 1976, based on a multiple-use paradigm (Davis, 1997b; Switzer, 2004). The two acts coupled with the National Environmental Policy Act (NEPA) of 1969 have moved the agency away from domination by an industry that held a vested interest in the policy of the Forest Service to one that is accountable to a broad spectrum of stakeholders and interests, at least in theory. The multiple use framework requires that the Forest Service manage its holdings for interests including industry, recreation, and conservation. The disparity between management expectations and demands from competing interests has spawned continuous conflict over the use of Forest Service lands, this is especially true for those lands that have been recommended for or have been identified as Wilderness or Roadless.

The BLM, like the Forest Service, is guided by a multiple-use framework. BLM policy is derived from the Federal Land Policy and Management Act (FLMPA) of 1976 which was driven in the 1970's by the burgeoning environmentalist movement's call for improved grazing legislation. This took place upon viewing the Taylor Grazing Act as a failure that had allowed for overgrazing of BLM administered land with devastating environmental consequences (Davis, 1997b; Layzar, 2006). In developing her case to demonstrate the detrimental effects of overgrazing Layzar (2006) offers, "by the mid-1970's, 98 percent of the arid lands in the western United States... had undergone some degree of desertification" as a result of poor federal policy and management. Like Forest

Service policy-making and management, BLM multiple use management decisions are often controversial and when coupled with other federal environmental legislation allow a variety of stakeholders and interests entry points into the decision-making process.

The National Park Service policy, unlike the Forest Service and the BLM, has evolved into a preservation oriented framework. This has taken place as the NPS has struggled to implement the contradictory mission of the service (Lowry, 1997).

Created piecemeal throughout the late nineteenth and twentieth centuries (Varley, 1988) national park policy was as varied and individualized as each park. Disparate policy was removed through the Organic Act of 1916, which created the National Park Service and a nation-wide policy framework. The newly established National Park Service was given the duel mandate of managing the parks for public enjoyment, but in a manner that leaves them unimpaired for future generations (16 U.S.C. §1 from Johnson and Agee, 1988). This mandate has produced what many believe to be the over-utilization of the Parks as the NPS seeks to increase tourism while attempting to maintain the lands in a 'pristine' condition .

The maintenance of the National Parks and their *relatively* undisturbed lands have been identified as an essential 'core' for the preservation of ecological systems and their component flora, fauna, and wildlife habitat (Leal, 1990; Varley, 1988) especially in regions surrounded by national forests. The preservation aspect of the NPS mission would serve to later bolster the environmentalist drive for increased forms of utilization across other federal lands, particularly those held by the Forest Service and the BLM by placing conservation oriented values on land typically used for resource extraction.

The mission of the Fish and Wildlife Service (FWS), like that of the National Park Service, is preservationist in orientation, although one could argue more so as the FWS is charged with maintaining and managing the federal refuge system throughout the country. The FWS holds a unique position among federal management agencies as it is the lead agency in designating and coordinating species and species habitat under the Endangered Species Act (Bean and Rowland, 1997). This has had profound consequences throughout the Mountain West as the ESA is increasingly viewed as an impediment to economic development in the region.

A number of federal legislative acts not mentioned above, but equally important in determining the policy, procedures, and management of public lands influence and drive many of the conflicts in the Mountain West. Some of the more dominant pieces of legislation include, the Multiple Use and Yield Act of 1960, Classification and Multiple Use Act of 1964, Land and Water Conservation Act of 1964, Surface Mining and Reclamation Act of 1976, and Public Rangelands Improvement Act of 1980 (Davis, 1997b). As the names of the legislation suggest they cover a diverse set of interests that conflict with one another. One highly contentious piece of legislation that will be examined below is the Wilderness Act of 1964.

The Endangered Species Act of 1973 and its amendments, while not produced with land management in mind specifically, have produced a substantial impact on the actions and activities of federal management agencies and private citizens. Aside from the protections offered species under the ESA, the Act prohibits the 'taking' of species listed under the Act, which include activities that harm or harass a listed species. Section 7 of the ESA prohibits the federal government from undertaking any actions that would

jeopardize a listed species, section 7 also requires that a biological assessment be completed in order to ascertain whether or not a species and its habitat will be put at risk by a proposed federal agency action. Section 9 prohibits any entity, federal government or private citizen, from 'taking' a listed species. The FWS has produced a broad and contentious definition of 'harm' that includes not only the wounding or killing[1] of a species, but also such activities as habitat alterations. This broad definition coupled with the ability to curtail activities on private property has led to a number of court cases that have affirmed the FWS broad definition and application of the term (Bean and Rowland, 1997; Feldman & Brennan, 1998).

In the Mountain West the ESA has become somewhat of a pejorative as the Act is seen as inflicting undue economic hardship on a minority of citizens (Marzulla, 1996). This argument can be extended to both public land users and private property owners. The restrictions placed on the use of federal land through section 7 of the ESA, coupled with the FWS broad interpretation of 'harm' set the stage for potentially sweeping federal land policy change. Alternatively, the restriction placed on private property through section 9 have given rise to claims that regulation of private property under ESA is equitable to Fifth Amendment takings, not to be confused with 'taking' as defined under the ESA itself. In a region such as the Mountain West where dependency on public lands and the defense of private property run deep one can see how use of the ESA leads to conflict and volatility.

Conflicts arising from public land management and their administrative agencies with respect to wildlife take place as each agency attempts to address the concerns of a

[1] The definition of "take" found in Section 3(19) of the Endangered Species Act means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

species through the lens of its particular mission. This produces tension between those agencies that are multiple use in orientation and those that are preservationist. The tensions are exacerbated as identification of critical habitat for a species listed under the Endangered Species Act place disparate costs on the agencies, which in turn, may have undesirable consequences for particular constituencies. The case that may be the most familiar is that of the spotted owl, but it will become evident throughout this study that aquatic habitat, specifically habitat for the Yellowstone cutthroat trout, reaches across the lands and jurisdiction of a number of different agencies, states, and private citizens affecting a variety of interests.

Federal land management agencies are not only torn between interagency strife and competition, but must contend with internal disagreements over management that has evolved with rise of the environmental and the wise use movements. These conflicts have recently become exacerbated as the call for an ecosystem approach to policy and management has received increasing attention, producing calls for the agencies to produce policy and management activities in a manner that is wholly new and often unfamiliar.

The Mountain West and its subcomponent, the Greater Yellowstone Ecosystem, contain lands administered by every agency mentioned above. Being that the ecosystem and its wildlife do not adhere to the arbitrary political boundaries of specific agencies we can begin to see how the different mandates and policies of public land sets the stage for conflict over wildlife policy within and among the federal agencies charged with managing public lands, wildlife, and their habitat.

Table 2-1: Federal Land Holdings in Acres

	Forest Service	Bureau of Land Management	National Park Service	Fish and Wildlife Service	Wilderness Designation
Colorado	14,498,801	8,369,106	604,333	70,042	3,348,700
Idaho	20,715,568	11,993,499	96,268	48,563	4,005,712
Montana	16,923,859	7,964,028	1,214,234	627,548	3,443,038
Nevada	5,836,348	47,860,756	774,509	2,333,538	2,754,180
Utah	8,139,568	22,867,662	2,094,161	107,227	800,614
Wyoming	9,238,063	18,355,293	2,343,693	70,674	3,111,232
U.S. Total	**192,857,908**	**261,950,378**	**77,659,476**	**90,269,238**	**106,255,809**

Source: Congressional Research Service (CRS) Report to Congress, *Wilderness Overview and Statistics,* Ross W. Gorte. Updated March 18, 2005.

Wilderness Areas and Roadless Rules

Wilderness areas are Congressionally designated tracts of relatively pristine public land that once designated preclude development to include timber harvest, mineral extraction, water resource development, road-building, and an eventual phase-out of grazing (Allin, 1997). Wilderness is defined in the Wilderness Act of 1964 as "an area where the earth and its community of life untrammeled by man, where man himself is a visitor who does not remain. Federal Land retaining its primeval character and influence..." Knowing that resource extractive industry has long utilized liberal public land policies for profit, one can image what controversies arise from wilderness designations.

As highly charged as wilderness designation continues to be, the call for its development came not from environmentalists, but as a result of interagency 'turf battles'. Competition between the Forest Service and the Park Service over ownership of recreational activities on federal lands and the Forest Service's fear of losing management of large tracts of undisturbed lands to the growing budget and land holdings

of the National Park Service (Gerard, 2000) fueled the conflict between the two agencies. The eventual result was a wilderness system that strictly regulated activities that could be conducted on the lands to low-impact recreation such as hiking, camping, and fishing. But even these low-impact activities may prove to be detrimental as the number of users continue to increase.

Restricting resource extractive industry from large tracts of public lands has been met with mixed results in the Mountain West when viewed over time (Rasker and Roush, 1996). Rural communities in the region have historically been dependant on natural resource extractive industries to sustain their livelihood and rural culture (Power and Barrett, 2001; Hansen, et al, 2002; McBeth and Bennett, 1998; Alm and Witt, 1995; Rasker and Roush, 1996; Davis, 1997b) . Removing large amounts of public land from potential industry utilization for the sake of preservation is highly contentious and a volatile driver for conflict over natural resource policy in the Mountain West.

Many see benefits flowing from wilderness designation beyond simply its removal for possible industry utilization. While many National Parks contain a large amount of fairly undisturbed habitat within them, a number of the Parks, to include Yellowstone, are bordered by National Forests that contain large tracts of designated wilderness (Harting & Glick, 1994). The wilderness within the forests surrounding national parks and their orientation towards preservation are seen as a buffer between relatively undisturbed Park lands and industry utilized forest and range lands. Noted by John Varley (1988), the long time fisheries biologist and Chief of Research in Yellowstone National Park, too often National Parks become viewed as aquariums which, by themselves, cannot maintain the natural ecological systems and processes

which many Parks are established to protect and conserve. Chapter four will demonstrate the role of wilderness with regards to YCT and the importance of undisturbed habitat in maintaining ecological systems to include the freshwater aquatic component. A different, but complimentary component of the undisturbed wilderness are the broad tracts of federal lands that have not yet seen the development of roads and their following effects throughout ecosystems.

The impact of roads on public lands greatly belies their size. Roads have been shown to fragment biotic communities and habitat, degrade aquatic habitat through polluted runoff, increase stress on fragile ecosystems, and lead to increased legal extractive industry usage (such as logging) and increases in illegal roads and trails (Trombulak & Frissell, 2000). With this in mind roadless areas on federal lands have been surveyed and identified (Allin, 1997) for possible protection.

Although roadless areas have been demonstrated as valuable assets for species conservation and the maintenance of unfragmented habitat, the Forest Service alone has allowed 2.8 million acres of formerly roadless lands to be developed. One account states that the "total miles of roads on USFS lands are now greater than the total miles of the U.S. Interstate Highway system" (Western Native Trout Campaign, 2001). This produces cascading consequences throughout an ecosystem affecting species and their habitat in a detrimentally synergistic manner.

One may expect that as with wilderness designation, roadless areas are controversial in the Mountain West for nearly the same reasons- that they preclude a number of activities that have historically been allowed on federal lands. Indeed roadless areas, as with wilderness, serve as yet another battleground between multiple use

advocates and environmentalists as they seek to shape public land policy in line with their values and belief systems.

Rural Communities and Natural Resource Extractive Industry

In the Mountain West culture, economy, and environmental concern are deeply interconnected, although often they are not complimentary. Perhaps nowhere in the U.S. is the scarcity of environmental resources so clearly perceptible as in the rural communities of the Mountain West. The role of natural resource extractive industry was alluded to earlier in this chapter, here the historical role of the industry and the shifting demography in the Mountain West will be examined.

Historically the Mountain West and its rural communities have depended upon natural resource extractive industries to fuel their economies and provide livelihoods (Power and Barrett, 2001; Hansen, et al, 2002; McBeth and Bennett, 1998; Alm and Witt, 1995; Rasker and Roush, 1996; Davis, 1997b). The past has profound consequences for the present condition of rural communities, their economies, and conflict related to natural resource policy. Public lands have been the keystone upon which the rural communities of the Mountain West have been dependant (Layzar, 2006; Hansen, et al, 2002). This has led to a number of hypotheses over the roles of extractive industry, rural communities, and environmental concerns and conflict.

Logging, mining, oil and gas development, and grazing have long dominated public land and public land policy through the use of the closed policy subsystems noted earlier. Only since the 1970's has there been a significant shift away from extractive industry (Power and Barrett, 2001). This change stood to have tremendous impacts on the rural communities of the Mountain West.

With the rise of the environmental movement in the 1970's and the reduced strength of industry and its related policy subsystems in dictating policy on public lands, a backlash arose from the rural communities of the Mountain West. The challenge is perceived by the communities as not only a threat to their economies and their livelihoods, but also to their culture (Davis, 1997a; Brick and Cawley, 1996). One example of this backlash was encompassed in the Sagebrush Rebellion.

At its broadest form, the latest sagebrush rebellion in a series stretching back to the 1880's (Davis, 1997a) consists of a host of interests seeking increased access to natural resources on public lands (Marzulla, 1996). Fearing a domination of western public land policy by eastern and urban elites, sagebrush rebels pushed for control of public lands to be relinquished to local and state agencies that the rebels argued may better manage the lands and their resources (Davis, 1997a; Marzulla, 1996). The last Sagebrush Rebellion coincided with the rise of the county supremacy movement (Davis, 1997a). The remnants of the sagebrush rebels, county supremacy movement and the growing private property rights advocates coupled with industry interest groups have given rise to the 'wise use' movement that now challenges the well established environmental movement (Davis, 1997a; Davis, 1997b; Hoberg, 1997; Brick and Cawley, 1996).

The 'wise use' movement has been labeled by some as the anti-environmental movement (Layzar, 2006; Hoberg, 1997; Jacobs, 1995). Rather than label the aggregate movement as anti-environmental Brick and Cawley (1996) note that the wise use movement is made up of a conglomeration of organizations that have historically relied on public lands and resource extraction, which were not always frowned upon in the

manner they are today. Furthermore, they note that in bringing together such a broad and varied number of interests has allowed the wise use movement to present a strong resistance to the environmental movement.

Some scholars have posited that the tie between resource extractive industry and rural economies has produced environmental concern that reflects the communities dependency on resource extraction and therefore environmental degradation (Freudenburg, 1992; McBeth and Bennett, 1998; Tremblay, and Dunlap, 1978; Lowe and Pinhey, 1982; Morris and McBeth, 2003); this explanation has been titled extractive commodity theory. A second theory that has been offered and that has produced mixed results empirically is that of the differences in attitude between urban and rural residence of the Mountain West. The urban rural dichotomy is based on the theory that urban populations are more likely to be inclined towards environmentalism than their rural counterparts in the Mountain West and therefore public policy involving natural resources, particularly on public lands, tends to be dominated by an urban environmentalism (Alm and Witt, 1995; Alm and Witt, 1997; Lowe and Pinhey, 1982).

The urban-rural linkage to conflict over natural resource policy in the Mountain West is said to come from a number of factors; factors that have been offered as possible sources of friction between urban and rural residence include the differences in economy (Tremblay and Dunlap, 1978), occupation (Freudenburg, 1991; McBeth and Foster, 1994), length of residency in a particular area (McBeth and Bennett, 1998) exposure to urban environmental degradation (Tremblay and Dunlap, 1978;Lowe and Pinhey, 1982), and socioeconomic status (Lowe and Pinhey, 1982). The resulting discussion over the differences between urban and rural residence has produce a New West vs. Old West

dichotomy (Morris and McBeth, 2003) in addition to the urban rural dichotomy. Contained within the New West vs. Old West dichotomy are two critical ideas, (1) that a shift in demographics in the Mountain West is partially responsible for conflict over natural resource policy and (2) that extractive resource industry and the rural economies that depend upon it are declining, which is also producing conflict over natural resource policy. Both aspects of the dichotomy will be examined to better understand the role of extractive industry, rural communities, and environmental conflict.

In attempting to understand conflict over natural resource policy in the Mountain West through the paradigm of an Old West vs. New West dichotomy, several scholars have examined the changing demographics of the region. One of the arguments to stem from this argument is that growth of the urban centers of the Mountain West has disproportionately outstripped the influence of the outlying rural communities (Alm and Witt, 1995). This, in turn, has resulted in debate and decisions over public land policy and management being dominated by the urban centers at the loss of the rural communities. The resulting outcome is federal land policy driven in an environmental direction rather than a utilitarian direction.

The second aspect of the Old West vs. New West disparity arises from the changing rural economy. As extractive industry has declined throughout the Mountain West the result has been the parallel decline in wealth, education, economic opportunities, and livelihood in the region. The wane of extractive industry can be traced to a variety of factors including economic depression, drought, weak markets, consolidation of industry sectors, and the boom-bust cycle related to extractive resources (Power and Barrett, 2001). The decline of the industry, while real, has produced what

has been termed a backward or rearview perspective of western rural economies, communities, and livelihoods (Powers and Barrett, 2001). This perspective has produced profound consequences on rural communities in that their history, folklore, and livelihoods are all tied to extractive resource industry. Powers and Barrett (2001) demonstrate that more than just the economic well-being is at stake when extractive industries depart from rural communities. For these reasons it has been posited that environmentally progressive policy on public lands in the rural Mountain West has produced backlashes such as the Sagebrush Rebellion and the county supremacy movement. It is in this atmosphere that the wise-use movement and its constituency have proliferated to challenge the established environmental movement, adding yet another layer of conflict to natural resource management in the Mountain West and the Greater Yellowstone Ecosystem.

The preceding sections of the chapter have outlined many of the issues that influence natural resource policy in the western United States. The following section focuses on the Greater Yellowstone Ecosystem and relies on the previous sections to develop the contextual map for natural resource policy-making in the region. Mapping the context of the policy system serves to tie together the above issues and the specific policy context surrounding the Yellowstone cutthroat trout.

Greater Yellowstone: A Contextual Map of Natural Resource Conflict

The Greater Yellowstone Ecosystem is an expansive ecological entity extending approximately 300 miles north to south and 150 miles east to west, covering an area of nearly 30,000 square miles or 19 million square acres (Clark & Minta, 1994). Before continuing it is important to define what an ecosystem is in order to provide the context

for which the remainder of the chapter, and this study, are based. An ecosystem, as a partially discrete entity, includes all forms of biota, their processes, products, sinks, goods, and services which exist in the context of constant, dynamic, non-linear change (Holling, 1986; Pirot, Meynell, and Elder, 2000). From the preceding definition the Greater Yellowstone Ecosystem included within its expanse two national parks, seven national forests, and three national refuges. The topography of the region is dominated by a multitude of mountain ranges that mark it as a northern portion of the Rocky Mountains. The Yellowstone region contains as much as 90 percent the earth's thermal features (Goldstein, 1992), with up to 10,000 features including 200 geysers (Clark & Minta 1994), which are what has given the region its fame and ultimately Yellowstone National Park its protection.

Prior to the ongoing drought in the region, it was not uncommon for the mountains of the GYE to receive more than 40 inches of rain a year (Dana, 1990). In turn, the mountains of the GYE contain the headwaters for three continental scale watersheds that are split three ways along the continental divide. The watersheds that spring from mountains of the GYE are the Missouri-Mississippi, Snake-Columbia, and Green-Colorado (Marston & Anderson, 1991). These headwaters are 75-85% composed of snowfall (Clark & Minta, 1994) most of which falls in the mountains.

In addition to possessing a surplus of water that is exported from the region by rivers that extend throughout the country, the GYE is rich in biological diversity. Up to 1,700 plants have been recognized (Clark & Minta, 1994), 1,000 of which are vascular plants, 200 forms of fungi (Clark & Zaunbrecher, 1987), 300 species of birds (Clark & Minta 1994) of which 160 species are nesting (Clark & Zaunbrecher, 1987), 70 mammal

species, 24 forms of amphibians and reptiles, and 10 species of fish (Clark & Minta, 1994,), and not to be overlooked are thousands of different species of invertebrates (Clark & Zaunbrecher, 1987).

While there is a vast array of plant species in the ecosystem, 80 percent of the vegetation consists of forest which, in turn, are dominated by the ubiquitous lodgepole pine (Clark & Minta, 1994). Other vegetative covers include aspen woodlands, subalpine meadows, and in high elevation mountains, large numbers of lichens (Marston & Anderson, 1991).

The GYE, like all other ecosystems, is subject to periodic disturbance. The most common non-anthropogenic disturbance in the ecosystem is fire, but small-scale disturbances include those produced by wind, slope failure, geothermal activity, and hoofed animals (Marston & Anderson, 1991).

Communities in the Greater Yellowstone Ecosystem, following the 2000 census, contained over 350,000 residents in the twenty counties that are wholly or partially contained within the ecosystem (Hansen et al, 2002). In the same work, Hansen and company noted that the population of the GYE skyrocketed 55 percent between 1970 and 1997, with a growth rate outstripping that of more than three-fourths of the United States. Like the wider Mountain West, the shift in demographics has produced a shift in the social and economic structures of the tradition rural economies of the GYE.

The rural communities of the GYE have historically relied upon resource extractive industries such as mining, logging, farming, and ranching to provide economic viability (Glick & Clark, 1998; Hansen et al, 2002). But, like the larger Mountain West, the GYE has seen a shift in its economic base that has accompanied the shift in

demographics. Where once logging in the national forests served as the primary form of employment, recreation related jobs now dominate the national forests (Power, 1991).

Due to the enormous reliance of rural communities on resource extraction on public lands, conservation has been viewed as detrimental to local economic development (Hansen et al, 2002). As the region has diversified from a resource extractive model of economic development to one more service oriented, an increasing number of values are being placed on public lands (Glick & Clark, 1998; Hansen et al, 2002; Power, 1991). The increase in values and the pressure on federal land management agencies to serve a widening constituency seeking greater access for different purposes and goals has been particularly contentious in the GYE (Glick and Clark, 1998).

Power (1991) offers that many in the GYE hold a "rearview mirror" perception of the economy. This perception tends to see the traditional industries as the continuing dominant force in the economy and therefore to be protected, many times at the cost of environmental conservation. The "rearview mirror" perception of rural economies in the GYE is based on the notion that economic livelihoods continue to depend upon natural resource extractive industries that have been the traditional economic drivers of the region. This of course is at odds with the reality that the region's economy no longer depends upon extractive industry for its survival, although much of the culture in the rural communities has not excepted this as a fact. In the results of a survey published in 1993, Reading et al, noted that two-thirds of the respondents from the GYE were unwilling to limit logging if it would harm local economies and that up to 70% of respondents believed that an ecosystem approach to management would moderately or greatly impact timber harvesting. This reveals the extent to which many in the region

continue to hold to the view that natural resource extraction is required in order to ensure economic viability and that conservation (i.e. an ecosystem approach) is opposed to economic viability. This view has created conflict between those who would see public lands managed for non-extractive purposes and those who would continue to see them managed for traditional economic purposes.

"One of the primary roles of the spectacular natural landscape of the Greater Yellowstone area is to attract and hold a population that *wants*[2] to live there" (Power 1991, p403). In accomplishing this, the region has seen a shift accompanying the growing demographics that wish to have natural amenities available to them (McGraham 1999 from Hansen et al, 2002). In 1991 recreation on national forest lands in the GYE accounted for 80% of the revenue in the forests of the GYE. But the flow of economic benefits from recreation are not as obvious as those from a timber sale (Power, 1991), which may account for at least a portion of the perceived reliance on sustaining extractive industries in the region.

Non-resource extractive uses of public lands in the GYE have begun to heavily influence local economies and will continue to do so more and more (Power, 1991). But the movement away from traditional public land use to one that leaves a lighter footprint on the environment may not be the silver bullet that many had hoped. While a high quality environment and the amenities that accompany it have drawn people to the GYE, the increase in use, even recreationally, have begun to produce signs of stress in the ecosystem (Hansen, 2002). While the rural economies of the region may depend more and more on the environment in non-traditional uses for economic benefit, there appears to be a limit to the amount and type of activities that can take place within the ecosystem.

[2] Italics from original text.

The ties between the economy and public lands continue to exert strong pressure on the political landscape of the GYE. The political landscape in the GYE is still heavily influenced by extractive industries (Reading, Clark, & Kellert, 1994), particularly mineral and energy development (Goldstein, 1992). The economies of the three states that contain portions of the GYE depend on excise taxes from mineral development throughout the states. This allows mining, and oil and gas industries to wield tremendous political clout in the state legislatures of all three states (Goldstein, 1992), which continues to foster the conflict over public land values and use.

The Greater Yellowstone Ecosystem is divided along 4000 kilometers of political boundaries (Glick & Clark, 1998) most of which belong to the federal land management agencies. The top-down management styles of the federal management agencies has led to conflicting goals and uses of public lands throughout the GYE (Glick & Clark 1998). Lack of common policy goals among the federal agencies and the three states has produced myriad detrimental effects on the ecosystem to include habitat fragmentation and disruption of ecological processes (Glick & Clark, 1998). The lack of common policy and goals is the single greatest impediment to an ecosystem approach to management in the Greater Yellowstone (Hocker 1979; Reese 1984; McNamee 1987; from Clark, Amato, Whittemore, and Harvey, 1991).

Political boundaries serve as points of conflict between federal agencies, many times along the lines of single use agencies versus multiple use agencies (Clark & Zaunbrecher 1987; Dana 1990; Goldstein, 1992). Conflict over political boundaries also spills over into contestations between states and the federal agencies in the region (Clark & Minta, 1994; Dana, 1990; Glick & Clark, 1998) as well as state versus state (Dana,

1990). The issues and conflicts themselves are highly diverse, but many have the common attribute of political boundaries. As an example, in the GYE the Forest Service is split into three administrative regions which are comprised of seven national forests (Clark & Zaunbrecher, 1987). Among this set of forests, the Forest Service does not possess the authority to manage the wildlife that reside within them. Rather, that authority rests with the states and is delegated to the Game and Fish agencies (Clark & Minta, 1994), which adds another layer to the already bureaucratically complex situation.

Changes to the management of the GYE are hindered by political borders, missions and mandated of the agencies (Goldstein, 1992), and a lack of shared goals (Glick & Clark, 1998). These challenges, coupled with the politics of a region that has embraced a historical view of the economy, has fostered resistance to changes in public land policy to include implementing an ecosystem approach (Glick & Clark, 1998). Nevertheless, several suggestions have been offered to begin and breech the high walls of resistance. Suggestions for the consolidation of the national forests into a single administrative unit have been offered (Clark & Zaunbrecher, 1987). Changing agency incentives and redrawing administrative boundaries have been proposed (Goldstein, 1992). Establishing a "Director of the GYE" has also been offered (Clark & Zaunbrecker, 1987), although the authority and extent of duties remain unclear. Finally, Glick and Clark (1998, p 152) offer, "giving stakeholders a voice in management decisions is perhaps the most controversial paradigm shift of all."

Not to be lost in the discussion of demographics, economics, public lands, and administrative boundaries is the role of private property in the GYE. Much of the private property in the GYE lies between large swaths of public lands that can be found

throughout the ecosystem (Clark & Minta, 1994; Hansen et al, 2002). Private property represents almost 37 percent of the land holdings in the GYE (Hansen, et al, 2002) much of which is the most fertile and productive land in the region (Clark & Minta, 1994). The fertility of private lands and their position in the landscape make them invaluable to rural communities and their economies, as well as wildlife and ecological processes throughout the ecosystem. This places private property at the undesirable crux of being a focal point for conflict in the region over natural resource values and use.

Conclusion

The preceding chapter has reviewed a multitude of factors that influence natural resource policy in the Greater Yellowstone Ecosystem. The issues presented throughout the chapter overlap and influence natural resource policy through the many interconnections between policy issues. The connections between social, economic, and political conflicts make natural resource management within the Mountain West and the Greater Yellowstone Ecosystem highly divisive and polarizing. Many of the conflicts become a matter of culture, which is influenced by history and tradition, something which is being challenged in the GYE and the wider Mountain West through a rapidly growing population and shifting regional economy. Although the relationship of communities in the GYE to public lands is dependant on their proximity to public lands (Clark & Minta, 1994), those counties in the GYE that continue to rely upon traditional extractive resource industries have stagnated economically, which has in turn, has led to stagnant population growth (Hansen, 2002). The implications have been borne out above as conflicts over values and economics polarize public land and natural resource policy among residents of the region.

The purpose of this chapter was to review a number of the social and political issues that influence natural resource policy in the GYE. By extension the issues presented in the chapter apply to the development and implementation of Yellowstone cutthroat trout policy in the GYE. The influence of each issue on a specific policy concern rests on a sliding continuum that continues to shift over time. The extent to which they overlap and influence other issues and the overall policy development and implementation will change over time. Specific examples of how each of these issues are interrelated and how they influence natural resource policy will be demonstrated in the case study of Yellowstone cutthroat trout conservation policy in chapter four.

CHAPTER III

BEYOND TRADITIONAL NATURAL RESOURCE POLICY: AN ECOSYSTEM APPROACH

Introduction

The preceding chapter outlined numerous issues that give rise to conflict over the crafting and implementing of natural resource policy in the Greater Yellowstone Ecosystem. Two bodies of theory have been engaged in this study, they include the theoretical basis of the Ecosystem Approach and the policy analysis framework of the Advocacy Coalition Framework. Select components of the Ecosystem Approach are reviewed in order to provide the reader with a sense of the encompassing paradigm shift that takes place during a transition from the traditional to the Ecosystem Approach to natural resource policy. Next is an overview of the advocacy coalition framework and a brief discourse of other relevant policy analysis frameworks. Discussion of the ACF includes its application to the Ecosystem Approach and accompanying difficulties. This chapter will contrast the differences between the traditional approach to natural resource policy-making and the Ecosystem Approach, which will be followed by an overview of the policy analysis framework selected for this research.

Interspersed throughout the chapter are the hypothesis statements that the Yellowstone cutthroat trout case study attempts to address in chapters four and five. The hypothesis statements have been developed from the research questions in chapter one and are placed throughout the text of this chapter following the appropriate component of the theoretical framework from which the hypothesis is derived.

Table 3-1 provides an overview of the components of both theories engaged for the purpose of this research.

Table 3-1: Theory Components

Ecosystem Approach		Advocacy Coalition Framework
Holistic Multi-disciplinary Goal Oriented Ecological Boundary-based Broad-based Public Involvement		Elite Based Tri-partite Belief Systems Policy Subsystems Influence of Technical Data Long-term Policy Analysis- greater than 10 years

Traditional and Ecosystem Approaches to Policy: A Comparison

The two following sections briefly describe the two different approach to natural resource policy development explored in this thesis. The first section is a critique of the traditional approach to natural resource policy and management, which has partially led to the need for the new policy paradigm encompassed in the Ecosystem Approach. The second section provides the theoretical basis that separates the Ecosystem Approach from the traditional approach before beginning a select review of the individual components of the Ecosystem Approach.

Traditional Natural Resource Management: An Overview

The ecosystem goods and services upon which human society and all forms of life within the biosphere depend upon have become increasingly impaired, to the point where some ecosystems have become so severely impacted that many have effectively collapsed and reorganized into simpler systems. Unfortunately, one of the largest contributors to the deterioration of ecosystems and their goods and services has come from the traditional reductionist model of natural resource management.

The reductionist, status quo model of natural resource management is the result of an historical trend towards reducing problems to their smallest component, which is a reflection of the scientific model of problem solving. The result is a piecemeal approach towards natural resource policy and management (Gunderson, 2000). This model has, in turn, produced institutional failures (Becker, 1996) that contribute to the anthropogenic produced stress placed on ecosystems. The greatest dimension of institutional failure is not a lack of diligent and determined work by natural resource agency staff, but political boundaries which incoherently divide ecosystems into policy and management fiefdoms. Problems produced through anthropogenic induced stress on ecosystems often "transcend legal and administrative boundaries adopted for other purposes" (Pirot, et al, 2000, p22), but are nevertheless applied to natural resource management. This has led to the inability of natural resource agencies to widely and effectively deal with cross-boundary ecosystem stress or impairment (Clark and Zaunbrecher 1987; Clark, et al., 1991). Many of the problem stems from the inability of management agencies to effectively deal with the multitude of scopes and scales at which ecosystem functions, goods, services, and impairments take place (Alcoma & Bennett, 2003). As was demonstrated in chapter two, the Greater Yellowstone Ecosystem has been carved up along political boundaries, which has led to increasing conflict due to attempts by management agencies to craft policy strictly within the limits of their agencies boundaries.

Fault cannot be placed on the natural resource management agencies without bringing to bear the political, societal, and economic dynamics that have influenced and shaped the agencies and their actions. Federal natural resource management agencies in the United States were established not to serve as stewards of the environment, but to

support private industry utilization of the federally owned natural capital (Layzar, 2006). The historical mission of federal resource management agencies was to convert the natural capital found on public lands into economic capital. But as the linkages between the economy, human consumption, and environmental stress and degradation become evident, some blame is to be placed on the economic model that perpetuates unsustainable stress on individual and aggregate ecosystems. Rees (2000, p142) has this to say on the subject, "in effect, conventional economic theory sees humans as free to act as if economic production/consumption were somehow exempt from thermodynamic and other critical laws." Understanding the capacity of an ecosystem is only one facet of the solution, human consumption patterns must be brought into line within the constraints of ecosystems and their goods and services (Straussfogel & Becker, 1996). The economic system which fosters human consumption inevitably becomes problematic when continual, perpetual growth is the goal (Rees, 2000). Insomuch that the capitalist economic model has driven the mission and actions of natural resource agencies, the dawn of the modern environmental movement has also produced impacts on natural resource agencies.

As the environmental movement has grown within the United States, natural resource management agencies have increasingly become the target of scrutiny, regulation, and litigation. The result of increasing exposure to civil society and the general public has been accompanied by greater demands from a increasing number of constituencies, which, one could argue, has spawned the call for a new policy and management paradigm.

The Ecosystem Approach as a Policy Paradigm

The Ecosystem Approach to natural resource policy is a holistic paradigm that runs counter to the traditional reductionist, status quo natural resource management paradigm of the modern era (Becker, 1996). An Ecosystem Approach is a departure from the reductionist policy and management paradigm in that "this values framework sees the human or social ecological system as existing within constraints imposed by the natural ecological system and recognizes that there are systemic carrying capacity limits, and costs to humans for their manipulation of the natural system in ways that cause carrying capacity to be exceeded. A fundamental assumption is that the human social system ought to view a healthy biosphere as an end in itself" (Francis, 1991; John Clark, 1990; Vallentyne 1986; from Becker, 1996).

The EA paradigm of natural resource policy-making and management begins its departure from the traditional model by imbedding the value-laden human aspects of policy-making within ecosystems (Strassfogel & Becker, 1996). Rather than removing humans and their activities from the ecosystem through a reductionist model that divides each aspect into its individual component, thereby removing the interactions of the individual components from problem-solving, the Ecosystem Approach embraces human activities as a critical component of an ecosystem's entirety. When utilizing the EA paradigm to address the degradation of ecosystems, EA squarely places human society and their actions within the context of stress placed on the ecosystem and the human aspect of ecosystem remediation. But this cannot be done without addressing the varying roles within and across human societies and their interactions with the natural capital of

an ecosystem. Because the EA paradigm is a holistic, systemic approach to policy and management, human activities must be related to and understood within the scope of the ecosystem. "Because human society is viewed as an integral part of an ecosystem, not as separate from it, knowledge of the structural and functional interrelationships between humans and other living organisms and their physical environment that provides their life support is assumed to be essential for effective policy and management decisions " (Becker, 1996, p2). When considering human relationships within the Ecosystem Approach, one must include the interactions of human activities and the non-living geochemical functions of ecosystems as well. It is the relation of human communities and activities to an ecosystem in its entirety rather than individual components of the ecosystem that lie at the heart of an Ecosystem Approach paradigm (Becker, 1996).

The Ecosystem Approach is a paradigm through which the policy process provides an "ecologically rational" lens that seeks to integrate the human system with the natural systems of the ecosystem (Coldwell, 1991; Milbrath, 1990, 1988; Francis, 1991, 1990; Resier 1988; Dryzek, 1990; from Becker, 1996). This model of the policy process recognizes humans and their institutions as subcomponents of the ecosystems that interact with the processes and functions of an ecosystem (Straussfogel & Becker, 1996). This linkage requires that humans and their actions be understood as the underlying cause of ecosystem stress and therefore the source to be regulated by the policy process and the implementation of public policy. Recognizing humans as a part of the ecosystem also has the dual effect of treating the source of the stress on the ecosystem and preventing a reductionist mentality from shaping the policy process. Dealing with the anthropogenic drivers of stress on an ecosystem requires that direct and indirect human interactions

beyond localized impacts and activities be considered; this requires that broad, contextual understanding of the societal, political, and economic drivers of ecosystem stress be identified and accounted for. Developing policy that is this holistic in its scope cannot functionally be implemented if applied only to select components of the problem, especially if those components act in a synergistic, interconnect manner within and throughout the ecosystem.

Having compared the traditional approach and the Ecosystem Approach to natural resource policy, the following hypothesis statement is offered-

$\mathbf{H_1}$: Yellowstone cutthroat trout policy and management are conducted in accordance with the traditional reductionist model of natural resource policy-making in the Greater Yellowstone Ecosystem.

The end result of the difference between the two paradigms to natural resource policy development is best summed up in the Ecosystem Approaches' goal of achieving sustainability. Management and regulation of human activities aligned with the capacity of ecosystems is ultimately sought in order to achieve sustainability. Aspects of sustainability will be further explored in the following sections of the chapter.

Components of the Ecosystem Approach to Natural Resource Policy

An Ecosystem Approach to natural resource policy and management contains a number of components which must all be present if there is to be movement towards a policy of sustainability in the Greater Yellowstone Ecosystem. The Ecosystem Approach as seen by Becker (1996) and Clark (2002) contain a number of elements that are critical to a successful ecosystem-wide policy development. They include:

1. Clear and unambiguous goals that reflect accurately specified problems within the ecosystem.
2. A legal mandate.
3. Robust policy and management institutions that are:
    a. Vertically and horizontally integrated.
    b. Adaptive and flexible to changing circumstances affecting the ecosystem.
4. A policy process that is established along ecological boundaries rather than political boundaries.
5. Holistic scope and scale to natural resource policy and management.
6. Adherence to the precautionary approach.
7. Full spectrum monitoring and reporting that provides accountability through feedback.
8. Broad-based public and stakeholder involvement.

The following subsections will discuss the role of the Ecosystem Approach in not only shaping, but redefining the parameters of the policy process. The Ecosystem Approach becomes cross-sectoral and influences far more than natural resource policy through its holistic approach, which requires an interdisciplinary understanding of the human impacts and sources of stress in the ecosystem. Not every component and subcomponent has its own subheading within this section of the chapter, but each components is covered to some extent. Hypothesis statements throughout the following subsections are organized in a manner that reflects the theory component from which

they are derived. Following a review of the components of the Ecosystem Approach is an examination of the role of stakeholders in shaping policy as seen through the advocacy coalition framework.

Ecosystem and Policy Goal Establishment

The purpose of an Ecosystem Approach to natural resource management is the management of human activities and interactions within ecosystems. Developing public policy in such a broad context requires that detailed attention be paid to institutional, societal, economic, demographic, and biogeophysical properties and interactions of the ecosystem. Public policy encompassing this scope and scale must begin with a "state-of-the-ecosystem" assessment that identifies stress placed on the ecosystem and the underlying human activities that have acted to produce the stressor (Regier, 1988; Liroff 1990; Chriestie, at al, 1988; Vallentyne 1976; Hamilton 1986; Caldwell 1990; and Francis 1991; from Becker 1996). Identifying the anthropogenic causes of the stressor will allow for the remediation of the cause of the stress rather than simply treating the symptom which the stress has produced.

The "state-of-the-ecosystem" assessment allows for the measurement of ecosystem health. The purpose behind the assessment is the identification of the sources of ecosystem stress that may be traced from anthropogenic activities. Once identified goals and criteria for implementing ecosystem level conservation and remediation may take place. Conservation or remediation of the health of an ecosystem is only one of the goals of an Ecosystem Approach, such that human and societal health is ultimately a result of ecosystem health. The Millennium Ecosystem Assessment astutely observes that it may be societal, economic, and institutional aspects of the human component of the

ecosystem that may be the final determinant of an ecosystem's health. It is therefore imperative that the public policy process be brought into line with the scope, function, and capacity of the ecosystem in which the policy is being developed. Furthermore, the institutions in which natural resource policy is implemented "must have the functional capacity to operate within the relevant spatial and policy domain boundaries of the particular system" (Becker, 1996, p12). This requires that the political boundaries that currently exist and divide ecosystems into unsustainable individual components be overcome by institutions that are vertically and horizontally integrated in a manner that accounts for the cascading consequences of policy implementation throughout the ecosystem and governmental institutions.

Following a "state-of-the-ecosystem" assessment is the development of clear, unambiguous goals. Policy goals under the Ecosystem Approach are directed toward removing the cause of a source of stress or impairment of the ecosystem. It is important to understand that causes for individual impairments of a particular ecosystem or portion of the ecosystem will be unique to the specific context of that ecosystem (Becker, 1996). Addressing the appropriate scale of a given problem will help shape an outcome in accordance with established goals. The establishment of clear and unambiguous goals is imperative to the later requirements of developing institutional integration. Without the coherent, rational goals associated with the mitigation or remediation of ecosystem stress in line with developing sustainability, there is little incentive to develop integrated institutional capabilities.

Institutional Integration and Legal Mandates

The very nature of ecological issues and their corresponding policy and management paradigms are inherently complex (Becker, 1996) and as such require coordination between those institutions responsible for the environment and the multitude of other sectors of society (Chopra, Leemans, Kumar, & Simons, 2005). Those institutions and agencies responsible for environmental policy within the EA paradigm must develop the capacity to address non-hierarchical, non-linear, ecosystem components and interactions in a policy system that accounts for a multitude of temporal and spatial scales (Straussfogel & Becker, 1996) that may not themselves be interconnected. The dynamic interactions of an ecosystem, the living and biogeochemical processes and functions prevents policy solutions from successfully reducing problems to their basic, separate components as a solution (Becker, 1996). Instead, the Ecosystem Approach requires that the policy process *and* the ecosystem in which policy is developed be understood in a holistic fashion. In order for government institutions and agencies to enact public policy in the holistic fashion of the EA paradigm, Becker (1996, p36) has identified three components which must be provided if success is to be achieved: the first is "the active involvement of a broad representation of ecosystem users," the second is a range of policy tools and mechanisms available "to change human behavior and reduce stresses on the system," and finally, a monitoring and evaluation system that regularly reviews the performance of those institutions and agencies involved in natural resource management.

Institutional integration is a means of transforming the current natural resource policy and management regime from one of independent political fiefdoms to one that is robust in its ability to act across political boundaries throughout an ecosystem. The

horizontal integration component would see the removal of traditional political boundaries, perhaps not in the literal sense, but along the lines of integrated inclusive policy development aligned with established discreet goals. In the Greater Yellowstone Ecosystem the reformation of the typical institutional approach would see cross-boundary coordination of federal agencies such as the Forest Service, National Park Service, the Bureau of Land Management, and the Bureau of Reclamation. Institutional integration does not end with the achievement of horizontal integration, but must be undertaken along with a vertical integration component.

Vertical institutional integration includes development of the capacity of a single agency to utilize its capabilities from top to bottom in support of designated policy goals and the integration of agencies at the federal, state, and local levels. Internal integration will be the easier of the two and can take place through a top-down process and political leadership found within the agency. Integrating institutional capacity from the federal, state, and local levels requires a much more broad effort and likely increased conflict. But it is essential that all levels of natural resource management be aligned in a manner that supports the policy goals established for mitigating or remediating damage already done to the ecosystem. There will likely be a high level of resistance to the horizontal integration of natural resource agencies, but it is here that the political will developed by public involvement will become particularly important. A means to accomplishing this will be through the full spectrum monitoring and reporting requirement that can reveal the level at which goals are not being accomplished. This allows for establishing accountability throughout all levels, but brings to bear responsibility on a specific agency or department for failure, something that is too often missing. It is highly unlikely,

knowing the friction between the various levels of government, that natural resource agencies will look kindly upon the sort of broad-based integration needed for an Ecosystem Approach. Providing incentives for agencies and staff to be proactive in its efforts is one method of moving down the path of integration, but the far more likely path is a legal mandate.

The current fractured and disjointed levels of natural resource agencies will most likely require the development of a legal mandate to undertake an Ecosystem Approach, which on the surface would appear as a loss of agency independence and a complete restructuring of American natural resource law across the board; this may be a false assumption. Keiter (1989) argues that the legislation currently enacted by the federal government coupled with the powers of the states allow for the development of an Ecosystem Approach to natural resource management. If this is true and the legal mandate already exists for an Ecosystem Approach then it is possible to surmise that federal, state, and local government would still control individual agencies, which would continue to answer to their particular constituency. What would need to change is the manner in which the different levels of government coordinate. If the legal tools are already available, what is truly needed is a device that requires institutions to coordinate in pursuit of clear goals that seek to mitigate and remediate ecosystem stress.

The Precautionary Approach and Adaptive Management

The precautionary approach to natural resource policy and management is a device that accounts for the uncertainty of the future and the lack of complete knowledge of an ecosystem and its functions. The policy device prevents those who would use uncertainty as a tool in influencing policy from preventing the development of beneficial

policy that is in line with goals established for the maintenance of ecosystem health. The precautionary approach maintains that actions taken by institutions responsible for natural resource management err on the side of caution and therefore on the side of human and ecosystem health when implementing new policies. This is a large departure from the current situation that sees continual over fishing of marine species, massive loss of habitat to various industries, and continued contamination of plants and animals (including humans) by products not fully tested. The onus for undertaking new policy or managerial practices is on the agency or user group to demonstrate a lack of harm to the ecosystem prior to engaging in new activities. An assessment must be done in such a manner as to offer conclusive evidence that the activity is benign or that it will not serve to act as a driver of stress in the ecosystem.

Ecosystems are comprised of a multitude of systems of which individual functions and interactions may take place in divergent temporal scales. The policy process that is encompassed by an Ecosystem Approach understands that accounting for such a chaotic and diverse set of interactions in a proactive manner may not be to the advantage of policy makers, therefore those involved in policy-making must, at the least, be aware of the disparate scales and their ability to influence policy over time. This is accomplished through the use of an adaptive management mechanism. In light of the fact that "direct and indirect drivers operate at different spatial, temporal, and organization scales," (Chopra, et al, 2005, p2) a properly prepared adaptive management regime includes a sustained monitoring and reporting mechanism that provides policy-makers the flexibility to alter policy to account for changes in the ecosystem.

The monitoring and reporting systems contained within the adaptive management mechanism must be developed in such a manner that the information and data produced is used in support of a positive feedback mechanism. That is to say that as new information and data is produced and interpreted, the data must be inserted into the policy and decision-making apparatus at multiple levels so understanding of the changes in the ecosystem are accounted for in the broadest possible context. The EA policy process is not a top-down or command and control style policy process; as demonstrated above it is an inclusive framework requiring understanding and interactions at multiple levels. Therefore, accounting for changes in the ecosystem and the need to adjust policy accordingly is best done as new data is distributed to the greatest possible extent, thereby reducing the risk of data suppression, misuse, or the inclination to use new information to enact a traditional command and control style policy process.

What may be viewed as the greatest difficulty or constraint on the inclusive framework of Ecosystem Approach - the need to deal with multiple, sometimes overlapping, but often disparate scales- becomes a boon when the adaptive management monitoring and reporting mechanism is developed for an EA policy process. The benefit of identifying and accounting for multiple temporal and spatial scales within the policy processes is derived from the likelihood that by focusing on a single scale critical interactions are much more likely to be overlooked or unaccounted for, thereby preventing policy makers from identifying the correct cause of a driver of ecosystem stress. Such an outcome is further amplified when the socioeconomic, political, and ecological drivers further influence the direct or indirect driver of ecosystem stress (Alcamo & Bennett, 2003). Therefore, monitoring and reporting at multiple scales

ecologically and socioeconomically are necessary to address unprepared for outcomes. Monitoring at multiple levels and reporting broadly allows policy makers to avoid or minimize the effects of a 'surprise' in the ecosystem. But as Holling (1986, p311) notes "how long an inappropriate policy is successful depends on how slowly the ecosystem evolves to the point when increasing fragility is perceived as a surprise and potential crisis."

Broad-based Public Involvement

The Ecosystem Approach is an inclusive policy paradigm that seeks stakeholder involvement at all levels. Stakeholder involvement includes active participation in information gathering, agenda setting, decision-making, and monitoring; including stakeholders in such a broad manner requires that information be made readily available at all levels of involvement to all stakeholders. Without adequate information, stakeholder participation is stymied and leads to exclusiveness and conflict rather than collaboration and conflict resolution (Chopra, et al, 2005). All too common in natural resource management is the tendency for professional networks to develop and internalize information without making it available to the public in a manner that allows for active stakeholder participation. It is imperative that professional and technical networks work with stakeholders to develop a common understanding of the problem as well as a way in which to communicate the data that supports the policy process (Pirot, et al, 2000). The development and sustainment of political will is directly tied to the ability of stakeholders at all levels to understand and participate in the achievement of policy goals (Becker, 1996), a situation that is unlikely if data is reserved for or understood by only professional, scientific, and technical communities. Pirot and company (2000) have

recognized that in the absence of active stakeholder participation and the dissemination of information that accompanies it, an Ecosystem Approach becomes an end in and of itself rather than the enabling tool for holistic policy and decision-making.

Building on the hypothesis statement that YCT policy is conducted in the traditional, status quo approach and recognizing the need for broad public participation under the Ecosystem Approach, the following hypothesis statement if offered-

H_2: Stakeholder involvement in the Yellowstone cutthroat trout policy subsystem does not reflect the broad-based stakeholder involvement requirement of the Ecosystem Approach.

While the inclusive and collaborative nature of the EA paradigm seeks stakeholder participation as a means of policy goal attainment, the framework also acts to give stakeholders a grounding in the understanding of human activities in ecosystem impairment. Rees (2000) believes that modern society has become so psychologically distanced from nature that society has lost sight of the impacts that individual decisions have on a declining natural capital reserve. In his view, people have become so enamored with their lifestyle that they don't take the opportunity to question to what extent their level of affluence is depleting natural resources. Put in other terms favored by Rees, what is the size of the ecological footprint required to support individuals in their current standard of living? Extending the idea of the ecological footprint to the Ecosystem Approach brings to bear the need to identify how society, through its standard of living, relates to the ecosystems in which they live. The importance in this is that too often it is assumed that those who are the most impoverished are those most responsible for ecosystem impairment. Rather, by examining the ecological footprint of a first-world

household or community one can ascertain the extent to which not only the local ecosystem is impacted, but also reveals the impacts of decisions made at the household level on ecosystems that extend well beyond the immediate. When viewed through this lens it then becomes necessary to understand how stakeholder actions within and outside ecosystem borders act as drivers for ecological stress.

Understandably a policy process that is inclusive and seeks stakeholder involvement at all levels is cumbersome. The benefits of such an inclusive process is stakeholder ownership of the understanding of ecosystem impairment and the policy goals that seek to alleviate or remove said impairment (Chopra, et al, 2005). Understanding how decisions at the lowest level act to produce aggregate effects at the ecosystem level serves to psychologically return or ground humans and their actions in nature. In turn, the symptoms of stress on the ecosystem are understood through the actions of a local community in which the community has a vested interest in taking action to alleviate the stress. This allows for the development of active stakeholder participation throughout the policy making process and allows a community to take ownership of not only the original problem, but the attainment of the policy goal that seeks to alleviate the problem.

Achieving Sustainability

An Ecosystem Approach is not a goal in itself, rather the transformation from the traditional reductionist natural resource policy process to a holistic, inclusive framework is one goal. A second goal is the alleviation of stress on an impaired ecosystem or the remediation of an ecosystem that has had its capacity to internalize anthropogenic induced stress overwhelmed. It is important to note that if an ecosystem has reorganized

in the face of overwhelming stress, the drivers of that stress are still present in the newly reorganized ecosystem and continue to impact and influence the ecosystem. Those drivers continue to place stress on the system, although in ways which may be new and unaccounted for. So whether its ecosystem stress alleviation or remediation, the overarching goal of an Ecosystem Approach is to align human activity within the constraints of ecosystem capabilities, or in other words develop sustainability. Without sustainability as the ultimate goal of EA, the transition from reductionist to holist policy process, the integration of institutional and agency capacity and function, the empowerment of stakeholders, and the development of an adaptive management mechanism are all for not.

Understanding the capacity and tipping-points of individual ecosystems are only the beginning to establishing sustainability. Just as policy must account for multiple spatial and temporal scales, sustainability must be achieved at *all* scales within an ecosystem if it is to be truly sustainable. For as noted by Allen and Hoekstra (1994, p 102) "almost sustainable means not sustainable," they go on to note that "sustainability is a state not a process." The implications of this are far-reaching in that if any system or interaction within an ecosystem is unsustainable then the entire system in compromised. This then brings to bear the question on what timeline is sustainability to be measured?

Sustainability is a human construct in that it refers only to ecological systems in so much as how they continue to function in support of human life and well being. It could be argued that sustainability is therefore a political question and can be measured in a scale that is compatible to the policy process. But to address the question in this manner is to revert to the reductionist model of natural resource policy making by

separating the human component from the ecosystem and, as was noted earlier, human society and its components comprise ecosystem subcomponents. So to answer to what timeline or temporal scale must sustainability be attained becomes again attached to ecological processes. Understanding that local components of ecosystems with limited tolerances can lead to the failure of the entire system (Allen and Hoekstra, 1994), it makes sense to tie sustainability to the slowest ecological process of the ecosystem (Holling, 1986). It is open to question how to develop and maintain the political will necessary to achieve sustainability over the course of what is likely multiple human generations. Regardless, Allen and Hoekstra (1994, p105) believe that "it is crucial that the energy diverted through society be used to maintain viable ecological regimes that are stable in the long term." While long-term sustainability is the goal, the role of humans and the utilitarian and cultural links which exist between ecosystems and humans must be recognized within the policy process (World Resources Institute, 2003), thereby continuing to reinforce the linkages between humans and the ecosystem.

Critiques of the Ecosystem Approach

The EA paradigm is not without its critics. One of the most often cited, but least supported critiques of the paradigm is that the goal of the Ecosystem Approach is to return ecosystems to a "pristine" form of nature that existed prior to a specific period of time. In the United States the argument assumes that period to be pre-Euro-American colonization of the continent. This is also largely the same argument asserted by wise use groups against environmentalists when challenging the traditional role of industry and private enterprise on public land in the Mountain West. This time utilizing the phrase of a federal lands "lock up". Regardless of who or where the critique comes from, EA notes

that under the current global political and economic system, returning ecosystems that have already been impacted by anthropogenic influences to a "pristine" state is neither achievable nor desirable. The approach seeks, through the ultimate goal of sustainability, to balance the needs of societies within the capacity of an ecosystem. Therefore, continued human interaction within an ecosystem is a desired and accounted for component, rather than one that must be removed from the ecosystem. "Thus human activity directed toward sustainability does not promote the pristine, but it [human activity] must line up with the natural ecological flows that emerge in anthropogenic settings" (Allen and Hoekstra, 1994, p105).

A second critique that is applied to the Ecosystem Approach is the unprecedented scale at which the policy and decision-making process seeks to accommodate. The need to develop such an expansive policy, monitoring, and data system may be seen as overreaching. The inability or outright failure of the policy and decision-making apparatus to appropriately utilize data within the EA framework is also a considerable barrier. Not to be overlooked is the lack of sufficient data throughout the policy-making structure (Chopra, et al, 2005). Furthermore, in attempting to develop indicators which reflect the multiple scope and scales of the ecosystem and the drivers of stress one must ensure that indicators correspond to the correct driver. Lindenmayer, Margules, and Botkin (2000), when studying forest ecosystems, offer that "selection of the wrong or inappropriate indicators could give a false impression of scientific understanding, managerial knowledge, and ecological sustainability." The difficulty in developing an understanding of ecosystem process, functions, and indicators cannot be understated. Without a interdisciplinary approach to problem-solving, research, monitoring, and

policy-making it will be unlikely that an Ecosystem Approach can overcome the current status quo natural resource approach.

Implementation of an Ecosystem Approach paradigm is a prodigious undertaking. In the United States overcoming bureaucratic inertia and bridging the gaps between stakeholders may require a reevaluation of the role of humans in nature. There is no doubt that the values system which underpins the EA paradigm leads away from the unfettered traditional activities enjoyed by utilitarian stakeholders.

The enormous challenges posed in implementing an Ecosystem Approach become even more daunting when considering the time that it will take to simply initiate the transition from the traditional, reductionist policy paradigm to an EA policy model. Transforming a top-down system into one that is vertically and horizontally integrated with related institutions and then making that apparatus nimble enough to develop, monitor, report, change, and implement policy is an enormous task. But there is evidence that a burgeoning effort is afoot to attempt just such an undertaking. The United Nations Millennium Ecosystem Assessment brought to light not only the need for an EA approach to policy and management, but in many cases highlighted the impacts that traditional policy efforts have failed to rectify.

Stakeholder Involvement and Policy Analysis

Broad public participation, as noted above, is at the heart of the Ecosystem Approach and is sought at all levels of the public policy process. The role of grassroots and elite stakeholders in influencing the current policy process must be given equal standing. The policy process is a subcomponent of the ecosystem, therefore understanding the beliefs systems of stakeholders at all levels provides policy-makers

within an ecosystem a better understanding of the political and contextual landscape in which the policy process takes place. Just as identifying and accounting for ecosystem stressors cannot effectively be accomplished in a reductionist manner, neither can stakeholder involvement in the policy process be reduced to its smallest components. The advocacy coalition framework developed by Sabatier and Jenkins-Smith (1993, 1999) provides a theoretical model that identify and account for aggregate stakeholder influence on the policy process based on the belief systems of elite stakeholders. Hypothesis statements within the chapter will be offered to include a mechanism for the inclusion of grassroots stakeholders in the of advocacy coalition framework.

Relating study of the policy process to the Ecosystem Approach requires a broad-based inclusive process, which includes grassroots stakeholders. Heikkila and Gerlak (2005) offer that the complexity of ecosystems and its diverse user groups and stakeholders who, geographically, may not live within the spatial boundaries of the ecosystem, make the already complex policy process even more perplexing. Although grassroots stakeholders are in the closest proximity to the ecosystem they are not the sole, nor many times the greatest resource users, of an ecosystem. Lubell (2004) argues that it is the decisions made at the local level that lead to the greatest impacts on the environment. Nonetheless, the impacts produced by dispersed stakeholders and consumers of ecosystem goods and services cannot be discounted in such a manner that it places the burden of responsibility solely on the local users. This leads to examining and dealing with the vexing problems of common pool resources (CPR). The way to best undertake the policy process surrounding CPR in a manner that reflects the scope and scale of the problems associated with natural resource policy and management, may be

by the tools provided by an Ecosystem Approach (Salka, 2004). This study has utilized the advocacy coalition approach to policy-learning as the framework for examining stakeholder participation in this case study, but it is important to briefly examine other policy analysis frameworks and theories.

Policy Analysis Theoretical Frameworks

Sabatier and Jenkins-Smith (1999) recognize that policy analysis serves a number of traditional roles in augmenting and shaping the overall policy process that include an "enlightenment function" (to be discussed under the advocacy coalition framework heading) and the establishing and retaining of policy "turf" by one or more stakeholders. With this in mind, a number of different policy analysis frameworks have been compiled by Sabatier, Focht, Lubell, Trachtenberg, Vedlitz, and Matlock (2005). The focus of their work pertains to solving the collective action problems associated with water bodies and watersheds. Developed to examine complex natural resource policy and common pool problems, the frameworks may serve to further examine the interrelated complex problems associated with the Ecosystem Approach. The following section will briefly review the policy analysis theories put forth by Sabatier et al, before addressing the policy analysis framework on which this study is based, the advocacy coalition framework. The theories to be briefly examined include the Institutional Rational Choice framework, the Institutional Analysis and Development Framework, the Political Contracting Framework, and the Social Capital Framework.

Within the Institutional Rational Choice (IRC) framework, "institutions are defined as the set of formal rules and informal norms that structure human behavior. Formal rules define sets of required, forbidden, and allowable behaviors; the agents

responsible for monitoring and compliance; and the punishments for violating the rules" (Sabatier, Leach, Lubell, and Pelkey, 2005: p.176). The IRC builds from the goals and behaviors of individuals to the cumulative effect of institutional norms and rules on the policy process. Within the IRC the Institutional Analysis and Development Framework (IAD) and the Political Contracting Framework (PCF) both serve as methods of empirical policy analysis of common pool resource problems(Sabatier, et al, 2005).

The IAD has largely been applied to the analysis of common pool resource conflicts (Sabatier, et al, 2005) and therefore is highly useful in the analysis of complex ecosystem issues. This theoretical paradigm rests on concepts developed from two primary components, "a set of stakeholders behaving according to an explicit model of the individual," and "a decision-action situation" (Sabatier et al, 2005: p.176). The IAD framework allows for the examination and analysis of multiple levels of rules whose outcomes result in public policy.

Moving away from the reliance on institutions and rules of interactions, the Social Capital Framework (SCF) relies on the tripartite components of trust, reciprocity, and "horizontal social networks". The three components of the SCF act in a manner to produce a "virtuous circle" that, in theory, overcome the problems associated with collective action and common pool resource conflicts. The SCF depends on the actions of policy elites rather than local stakeholders for the development of its social networks; in turn, the collective outcomes are the result of the negotiations of the policy elites.

The final theoretical framework which Sabatier, et al, explore in their work on collaborative watershed policy analysis is the advocacy coalition framework (ACF) developed by Sabatier and Jenkins-Smith (1993,1999). "The ACF differs from the IAD

[and the other frameworks outlined above] primarily in its model of the individual (Sabatier and Schlager 2000; Schlager 1995). While the IAD assumes self-interested stakeholders rationally pursuing relatively simple material interests, the ACF assumes that normative beliefs must be empirically ascertained and does not a priori preclude the possibility of altruistic behavior" (Sabatier, et al, 2005: p.190). The model of the individual in the ACF is one of a rational, complex belief system that is internally consistent in which values and priorities establish policy-oriented goals (Wilker and Milbrath, 1972; Cobb, 1973; Axelrod, 1976; Putnam, 1976: 87-93; Buttel and Flinn, 1978; from Sabatier and Jenkins-Smith, 1993; Sabatier and Jenkins-Smith, 1999)

The Advocacy Coalition Framework

The ACF was developed to overcome the tendency of political scientists to focus their policy analysis on Washington, D.C. and those institutions, individuals, and networks found therein. In many ways, the Washington-centric focus has been the result of the stage heuristic style of policy analysis that has focused on hierarchical institutions, elite behaviors, and the policy cycle rather than the causal mechanisms of the policy process and the more technical aspects and influences of policy debates (Sabatier and Jenkins-Smith, 1993).

The advocacy coalition framework has been developed from five criteria related to the policy process. The first, as outlined by the 1999 (p. 118-119) writing, is the utilization of technical data in influencing the policy process. Second is viewing the policy process and policy change in a temporal scale of ten years or greater. Third, is the establishment of the policy subsystem as the unit of analysis. Fourth, broadening policy subsystems to include a diverse stakeholder set; this may include researchers, educators,

and journalists in addition to the traditional legislators, special interests, and others. Fifth, elite belief systems serve as the cognitive mechanisms that drives the policy process and the formation of advocacy coalitions, which are aggregated into the larger unit of analysis- the policy subsystem.

To shed light on the need for a broader policy analysis framework the authors of the theory have this to say, "policy evolution over the span of time usually goes way beyond a few critical institutions or types of political behavior to include hundreds of government institutions, dozens of important elections in various jurisdictions, and several dozen "iron triangles" at various levels of government. It also includes entire categories of behavior—particularly technical debates over critical policy issues—neglected by the vast majority of political scientist" (Sabatier 1991a, 1991b from Sabatier and Jenkins-Smith, 1993).

The focus of the ACF and its advocacy coalition is in determining policy-oriented learning, which is the change in the belief systems of stakeholders and coalitions over time within the context of a policy subsystem. This stems from the "enlightenment function" an idea adopted by Sabatier and Jenkins-Smith (1993; 1999) from Weiss (1977) that says belief systems may be altered over the course of a decade or more as stakeholders (and the aggregate advocacy coalition) receive and accumulate evidence related to the policy, which serves as the causal mechanism for policy-learning and thereby policy-change. Changes in belief systems that result from policy-oriented learning come from five processes: "(1) individual learning and attitudinal changes, (2) the diffusion of new beliefs and attitudes among individuals, (3) turnover in individuals within any collectivity, (4) group dynamics, such as the polarization of homogenous

groups in conflict, and (5) rules for aggregating preferences and for promoting (or impeding) communication among individuals" (Sabatier and Jenkins-Smith, 1993:p.42).

Belief systems under the ACF are split into a tri-level, hierarchical structure and focus on the elite stakeholders in the policy subsystem. At the pinnacle of the hierarchy are the deep core beliefs which, are akin to religious convictions, reflect personal philosophy, are not empirically measurable, and are unlikely to be changed through the policy-learning process. Next are the policy core beliefs that comprise the normative structures of an advocacy coalition and its policy goals. The policy core beliefs, while setting the direction of policy goals, are those beliefs that are changeable through cumulative learning and experience over a decade or more through the "enlightenment function". The third and most mutable beliefs are those referred to as the secondary aspects. These are beliefs that are applicable to a specific policy implementation strategy and the search for information. The secondary aspects tend to be narrow in their scope and therefore the most mutable (Sabatier and Jenkins-Smith, 1993: p.30). The secondary aspects are the beliefs that are most greatly impacted by policy-oriented learning and the most susceptible to the changes wrought by disturbances to external system events. Policy learning is largely concentrated to the secondary aspects of the hierarchical belief structure because it is the most likely to be influenced by technical data in the short term (less than ten years), but technical information also serves to influence policy core beliefs through the gradual learning process. The role of technical data in policy-oriented learning will be discussed in a following subsection .

The advocacy coalition framework offers that the policy subsystem is the most appropriate unit for policy analysis, especially for natural resource policy. Sabatier and

Jenkins-Smith (1999) notes that the ACF has been applied to twenty-three cases involving environmental or energy policy, thereby making it compatible with highly complex and oft-times technical policy issues of which the Ecosystem Approach is comprised. The policy subsystem is comprised of stakeholders from the public and private sectors who have made the decision to become active in the debate of a policy problem, which allows for an inclusive, broad-based policy analysis that departs from the typical study of the closed relationships of "iron triangles". Whether the policy and its analysis spans one component of natural resource, which inevitably is tied to numerous other components of the ecosystem, or a multitude, "iron triangles" fail to adequately account for the multi-level, multi-scale dynamics that make-up natural resource policy within the Ecosystem Approach. In fact, the use of the "iron triangle" as the unit of policy analysis perpetuates the status quo by validating the closed, reductionist, exclusive tendency towards traditional natural resource policy. The advocacy coalition framework moves beyond this with the inclusive policy subsystem that accounts for stakeholders and governmental institutions at all levels *and* the casual mechanisms that produce policy.

The advocacy coalition, as its name suggests, aggregates stakeholders into coalitions within a subsystem. Advocacy coalitions are comprised of stakeholders from all levels of government and private organizations that share normative and causal beliefs and are capable of attempting to enact those beliefs into policy. Most policy subsystems contain two or more coalitions, each seeking to utilize its resources in order to implement their beliefs into policy within the subsystem. While the ACF, through its aggregation of stakeholders, is inclusive in its content, not all stakeholders in a subsystem necessarily

belong to an advocacy coalition, although they may or may not share the normative beliefs of other stakeholders in the subsystem.

Policy subsystems, as a unit of analysis, arise from the specialization of elites in an increasingly complex policy arena concerned with a specific policy problem. New policy subsystems arise from the dissatisfaction of stakeholders with the current policy situation so that they act in a manner in line with their policy core beliefs to structure a new subsystem in order to enact their beliefs into policy. In other words, policy subsystems arise out of the desire of stakeholders to influence specific policy problems that are in some manner associated with their core policy belief systems. Once a subsystem has been established and stakeholders attempt to shape policy, a new subsystem may arise along with a new issue or from a previously unutilized conception of the issue. This new subsystem may interact with the previously existing subsystem and may be comprised of many or all of the stakeholders of the previous subsystem along with new stakeholders associated with the new policy issue (Sabatier and Jenkins-Smith, 1993, 1999). The interaction of subsystems occurs along functional and territorial lines (Zafonte and Sabatier, 1998; from Sabatier and Jenkins-Smith, 1999) and may find one policy subsystem "nested" within another. In addition to the nesting of subsystems, two subsystems may overlap one another (Sabatier and Jenkins-Smith, 1999) to produce influences throughout one or more policy subsystems, which, in turn, may produce substantive changes to other policy subsystems and the regulation of human activities in an ecosystem.

Understanding policy change as an effect of stakeholders within a policy subsystem is a reflection of the scope and topic of the policy and its change. "*Scope*

means that the belief should apply to virtually all aspects of subsystem policy, rather than to only rather narrow ranges (which are covered by secondary aspects). *Topic* means that it should pertain to one of the subjects listed under "policy core" beliefs (Sabatier and Jenkins-Smith, 1999: p. 132)[1]. Policy change viewed through the lens of the scope and topic of a specific policy subsystem will determine the magnitude of the change. "Linking change to scope also makes it clear that the same change may be "minor" from one subsystem but "major" for a subsystem nested within it" (Sabatier and Jenkins-Smith, 1999: p. 147). Finally, when considering policy subsystems it is important to distinguish from "nascent" and "mature" subsystems and the advocacy coalitions of which they are comprised. A nascent subsystem is in the process of forming (i.e. the policy and the stakeholders surrounding the issue have been active less than ten years) while a mature subsystem has existed for more than a decade, the timeframe in which the ACF observes policy-change and learning (Sabatier and Jenkins-Smith, 1999).

Policy-oriented learning, developed by Heclo (1974) and utilized by Sabatier and Jenkins-Smith (1993, 1999) is the gradual alteration of behavioral processes spurred by experience over a decade or more and the development of new technical data and the "enlightenment function". Policy-oriented learning take place as the belief systems of advocacy coalitions are shaped and influenced by two sets of variables and the constraints and resources of subsystem stakeholders. The first set of variables are the relatively stable parameters of the policy subsystem which include the "basic constitutional structure, sociocultural values, and natural resources of a political system" (Sabatier and Jenkins-Smith, 1999: p.120). The second and less stable set of variables are the external system events that are likely to change, to a varying degree of magnitude,

[1] Italics are from the original text.

over the course of a decade. These stakeholders includes: (1) changes in socioeconomic conditions, (2) changes in systemic governing coalitions, and (3) policy decisions and impacts from other subsystems. The combined aspects of each set of variables influence one another, the constraints placed on subsystem stakeholders, and the belief systems of the advocacy coalitions of the policy subsystem. In turn, the actions of the advocacy coalitions are most likely to affect the more dynamic external system events creating an internal feedback loop within the policy subsystem and the policy process.

While highly resistant to change the nature resources of a policy subsystem do change over time. A dramatic example of the shift of natural resources in a policy subsystem was the discovery of lake trout in Yellowstone Lake in 1994, which has led to the following hypothesis statement-

H_3: The discovery of lake trout in Yellowstone Lake in 1994 was a disruption of the natural resources that comprise a portion of Yellowstone cutthroat trout policy subsystem, such that it influenced the policy core beliefs of the advocacy coalitions found within the subsystem.

Stakeholders in an advocacy coalition will seek to shape policy in a manner that aligns policy with their belief systems. The belief systems of the stakeholders will act to provide direction to the coalition and the policy which it seeks. "When confronted with constraints or opportunities, stakeholders attempt to respond in a manner consistent with their policy core" beliefs. The belief systems of advocacy coalitions may be altered "on the basis of perceptions of the adequacy of governmental decisions and the resultant impacts as well as new information arising from search process and external dynamics" (Sabatier and Jenkins-Smith, 1993:p.19).

Up to this point the discussion on belief systems has largely been focused on the differences between the three strata of belief systems and their role in shaping and influencing the policy process and influencing the actions of stakeholders and advocacy coalitions. The following section outlines means in which belief systems change over time within a policy subsystem.

Influencing Belief Systems

Learning within a belief system or coalition is the norm as stakeholders seek to strengthen coordination within the policy subsystem. Learning from different belief systems is a much more complex proposition and requires three components if it is to take place. 1. A moderate level of conflict between competing coalitions within a policy subsystem. 2. A high degree of analytical tractability that will allow technical data to be brought to bear on the policy issue. As consensus is forged as to the methods of data and analysis of the issue the greater the likelihood that opposing coalitions will recognize the common standard the technical data has produced for the issue. 3. An analytical forum that allows stakeholders from competing coalitions to openly communicate about policy relevant information and values. The type of forum open, closed, professional, etc. may be established to reflect the needs of the advocacy coalitions in question (Sabatier and Jenkins-Smith, 1993,1999). Through the combination of these three components there arises the possibility for learning across belief system, which also lends itself to the "enlightenment function" of the policy-oriented learning process. It is important to note this type of learning is less likely to take place in a highly conflictual policy subsystem. Within this "the AFC argues that the level of conflict will vary depending upon whether the relative stakeholders disagree on "secondary" versus "core" aspects of their belief

systems" (Sabatier and Jenkins-Smith, 1993:p. 24). Therefore it is important to recognize the level of conflict in a specific policy subsystem, which may be accomplished through the identification of the policy core beliefs and secondary aspects of the coalitions and followed by the identification of the sought policy change and what component of the belief system it attacks.

Not all stakeholders in a policy subsystem necessarily belong to an advocacy coalition; two sets of specific stakeholders fall outside of the normal advocacy coalition structures, although this is subject to change depending on circumstances. Policy brokers are those stakeholders who, while outside of an advocacy coalition, are nonetheless heavily active in a policy subsystem. They seek to restrain conflict by attempting to negotiate compromises between the various coalitions of a subsystem. Latent stakeholders are a second source of stakeholders within a subsystem that typically fall outside an active advocacy coalition, but with the right conditions, such as the use of technical data, may become active members of a coalition.

The ability of coalitions to influence policy will largely rely on the availability and extent of resources, which include money, expertise, and legal authority. It is here that the role of scientific or technical information can be most effective. The ACF recognizes that scientific and technical data can influence change in a number of aspects of beliefs systems, although in a highly conflictual policy subsystem such data is more likely to be used as a resource against another coalition seeking to gain leverage by attempting to discount the viability of the other coalition. This is in contrast to the use of technical and scientific data that is used in a fashion that helps serve as part of the "enlightenment function". In one sense this stems from what Sabatier and Jenkins-Smith

(1993, 1999) have termed "devil shift". The tendency to weigh losses more greatly than success and the attribution of false analysis to any technical data that challenges the core policy belief of a coalition. This leads to the "devil shift" and polarization within a policy subsystem.

The role of technical data is central to the ability of stakeholders to change the policy core beliefs and secondary aspects of the belief system of stakeholders in an advocacy coalition. Technical data that challenges the policy core beliefs or secondary aspects of a coalition's belief system, directly or indirectly, provide a forum for conflict within the policy subsystem (Sabatier and Jenkins-Smith, 1993). Technical data can serve to reinforce policy core beliefs, polarize debate, or catalyze learning across belief systems, a set of opposing functions that produce varied outcomes within a policy subsystem.

The separate and distinct functions of technical data in a subsystem provide stakeholders with additional resources and a means of influencing the policy debate in the subsystem and between coalitions. This may take place in a number of ways, which are partially dependant upon the level of conflict within the subsystem and the extent to which "devil shift" has taken place. The authors of the advocacy coalition argue that those subsystems with lower levels of conflict will more likely utilize technical data in a manner that allows for learning across advocacy coalitions, while coalitions in a highly volatile subsystem will attempt to use the data to reinforce the "devil shift" characterization likely leading to further polarization of the coalitions within the subsystem. The latter function of technical data takes place as stakeholders in a coalition seek to use the new technical data as a resource to further their own policy position. With

this in mind professionalized forums represent a highly viable means of influencing coalitions by fostering learning across belief systems. Sabatier and Jenkins-Smith (1999) offer, "a successful forum is defined as one (1) in which consensus is reached among previously disagreeing scientists on whatever technical and policy issues are placed before it, and (2) in which the forum's decisions are accepted by the major coalitions involved". Technical data, as will be covered in chapter four, has been used extensively in the development of YCT policy leading to the following hypothesis statement-

H_4: Technical data in the Yellowstone cutthroat trout policy subsystem has catalyzed learning across belief systems of opposing coalitions within the subsystem.

Government and Belief Systems

The advocacy coalition framework recognizes that policy is influenced by and takes place at multiple, often overlapping levels of government and that governmental institutions can have deeply held belief systems of their own. It has been recognized that the belief systems of government agencies are semi-resistant and as deeply held as those of other stakeholders in a coalition and are derived from the agencies mission and statutory authority (Sabatier and Jenkins-Smith, 1993; Nicholson-Crotty, 2005). No government agency operates independently and the hierarchical alignment of agencies gives way as the implementation of policy blurs previously clear lines between levels of the hierarchy. At the same time, this also produces intra-agency policy conflict. It is possible for a "superior" level of a government agency to attempt and impose changes to the policy core beliefs of lower, "subordinate" levels of said agency (Mawhinney, 1993; Sewell, 1999; from Sabatier and Jenkins-Smith, 1999), which, in turn, may separate

stakeholders in the same agency into opposing coalitions. Inter-agency conflict often takes place between natural resource management agencies to include disputes between federal, state, and local agencies.

Inter-agency conflict can produce opposing goals and beliefs within a coalition that must be identified and remedied for coalition cohesion or it can produce new coalitions with competing agencies with their missions at the center of opposing coalitions[2]. The mission of an agency may bring it into conflict with another competing agency, but just as likely is the competition between agencies over budget appropriations and responsibility, territorial, policy, or statutory authority (Salka, 2004; Nicholson-Crotty, 2005). In his case study on the Forest Service and the conflict over the spotted owl in the Pacific Northwest, Salka (2004) notes the near impossibility of a management agency in altering its mission without adversely influencing the agency's currently existing mission.

Not to be overlooked in the discussion of government agencies in policy subsystems are the role of constituencies. Each government agency, whether local or national in scope and composition, must, at the least, satisfy key constituencies lest the agency receive a rebuke; something along the lines of budget or personnel cuts (Bryson, 2004; Salka, 2004). Local government agencies are those most directly beholden and influenced by grassroots stakeholder policy beliefs and should not be left out of the research of advocacy coalitions. It is for this reason that Lubell (2004:p.342) notes that "from the policy sciences perspective, ignoring the views and behaviors of grassroots

[2] For a clear example of interagency conflict that is representative of advocacy coalition competition in a policy subsystem see- Sean Nicholson-Crotty, "Bureaucratic Competition in the Policy Process," in *The Policy Studies Journal*, 33(3): p. 341-361, and the competition over Echo Park policy.

stakeholders risk serious misunderstanding about the relationship between governance institutions and policy outcomes".

Local agencies, when accounted for in a policy subsystem that includes a grassroots component, may act as a vector for the delivery of policy information to local constituencies and stakeholders and act as an important locus of interaction at the grassroots level (Lubell, 2004). This ability becomes critical when considering that local agencies often have great latitude in implementing specific federal policies at the local level (Sabatier and Jenkins-Smith, 1993). What this appears to demonstrate is the need for policy subsystems to recognize the role of grassroots stakeholders and include their belief systems into advocacy coalitions where appropriate. It stands to reason that large portions of local stakeholders may serve as latent stakeholders only bringing to bear their political resources in the face of conflict within the subsystem under specific conditions.

The ACF, CPR, and the Need for Stakeholder Recognition

The advocacy coalition framework emphasizes the belief systems of policy elites when aggregating stakeholders into advocacy coalitions within a policy subsystem. When using the framework to examine policy subsystems surrounding collective action problems associated with watersheds partnerships, the AFC assumes that the subsystem for a specific problem (pollution, in stream flows, habitat, development, etc.) are dominated by specialists in that specific issues. This leads to two interrelated problems from the Ecosystem Approach perspective. First, policy subsystems are disassembled by component or issue in a reductionist manner that focuses on a single policy issue with disregard for the influences or the consequences of interrelated components of the ecosystem on the policy issue. As noted above, the ACF does recognize the influence of

one subsystem on another, but nonetheless assumes that policy subsystems are largely independent of one another. Second, the framework's dependency on elites overlooks the role of and does not account for the grassroots stakeholder beliefs. In this context grassroots stakeholders includes those individuals who utilize, influence, and interact with the ecosystem at the local level and therefore influence the policy subsystem. These individuals oft-times go largely unaccounted for unless the policy subsystem includes a special interest group within a coalition that reflects particular policy core beliefs. In his writings on political philosophy E.E. Schattschneider (1975) posits that public involvement in policy-making is fostered through the efforts of interest groups and the government, leading to his conclusion that without elites the public would lack the tools to influence policy. His conclusion leaves open to debate who is an elite and what standard ascension to the status of elite is based upon. Nonetheless, in the modern environmental policy arena local stakeholders increasingly influence ecosystems and policy issues surrounding them directly and indirectly. Therefore the interconnections of stakeholders and components of an ecosystem require that each be accounted for under the advocacy coalition framework if a holistic policy analysis is to be undertaken.

Acknowledging that one of the two most studied policy-core beliefs in the ACF is that of environmental ideology(Lubell, 2004), Heikkila and Gerlak (2005) note that local stakeholders must be included in collaborative policy-making. Furthermore, they offer that identifying individual, grassroots stakeholders is essential in managing the natural resources of an ecosystem. Policy analysis supported by the ACF does not require that all stakeholders be identified within a policy subsystem, but it does require that key stakeholders be included, and the author submits that this includes grassroots

stakeholders. This requires a distinct decision in who counts as a key stakeholder, which, in turn, has political and ethical implications (Bryson, 2004). Bringing grassroots stakeholders to the policy table is many times a matter of reducing or overcoming the transaction costs associated with collective action problems (Lubell, 2004), and/or the development of trust and reciprocity within the policy subsystem (Heikkila and Gerlak, 2005). This creates a conflict between the two bodies of theory engaged in this study. The Ecosystem Approach requires the identification and involvement of local and grassroots stakeholders while the ACF focuses solely on the belief systems of elite stakeholders. This creates the need for a form of reconciliation to take place between the two theories for effective use of both bodies of theory in this study.

Recognizing the need to incorporate grassroots stakeholders within natural resource policy analysis, the following hypothesis statement is offered-

H_{5a}: The advocacy coalition framework can be modified to extend beyond the use of elite belief systems in empirically determining the direction of policy in a subsystem to include grassroots stakeholders belief systems in natural resource policy subsystems.

Bryson (2004) in his work on identifying, engaging, and analyzing stakeholders offers that overcoming the transaction costs of common pool resources begin with demonstrating that there is a solution to the problem at hand before grassroots stakeholders are willing to become engaged. This harks back to the Ecosystem Approach requirement that the policy process begin with the establishment of clear, unambiguous goals or vision of an end state of the issue at hand and how it should appear in the ecosystem upon goal attainment. In the view of Heikkila and Gerlak (2005) a method for overcoming this problem begins with the problem definition and the technical

information that is available and provided to stakeholders. It is important to note that highly technical data must be offered to the public in a manner that allows them to consume it in a meaningful manner that, in turn, allows them to utilize its contents in the shaping of policy. This process is linked to the role of policy entrepreneurs or in the language of the ACF a policy broker- a stakeholder that is active in the policy subsystem but does not necessarily belong to an advocacy coalition therein.

Once grassroots stakeholder participation has been secured Lubell (2004) offers that social capital, of which one component is networks, become invaluable. Stakeholder networks are rapidly becoming as important, if not more so, than markets and hierarchies (Powell, 1990 from Bryson, 2004) when considering their influence on public policy. Connecting networks to the belief systems of the ACF takes place through ally networks, whose structure is close to that of the ACF's policy core beliefs (Weible and Sabatier, 2005). Ally networks possessing similar belief systems may coordinate in order to develop a synchronized strategy in seeking to translate their shared beliefs into public policy (Weible and Sabatier, 2005).

"Failure to attend to the information and concerns of stakeholders clearly is a kind of flaw in thinking or action that too often and too predictably leads to poor performance, outright failure or even disaster" (Bryson, 2004:p.23). Ally networks offer one solution to identifying and empirically demonstrating and measuring grassroots stakeholder participation in a policy subsystem. The author submits that one means to identifying grassroots stakeholder participation in a policy subsystem and inclusion in an advocacy coalition comes from the evaluation of public consumption documents. One source of information comes from comments offered through the requirements of natural resource

legislation that demand public participation. The public comments submitted provide a ready source of information pertaining to grassroots stakeholder inclusion in the policy subsystem, their policy core beliefs, and their activity within the subsystem. The public comment requirements of natural resource legislation is exceptionally fortuitous in that it allows researches a view into grassroots policy core beliefs in ways that may not be as obvious in other policy field, therefore the final hypothesis statement for this thesis is-

H_{5b} The belief systems of grassroots stakeholders may be empirically identified through the use of public comments garnered through the public participation requirements of specific natural resource legislation.

The policy boundaries of grassroots stakeholders become blurred when they are aggregated into a partnership or network in that they are now taking steps to see their policy core beliefs implemented into public policy (Lubell, 2004). This reinforces the need for the ACF to find a mechanism to evaluate and include grassroots stakeholders in policy analysis. Given the interconnections of ecosystems and policy fields and subsystems it becomes increasingly important to include grassroots stakeholders in policy analysis.

Conclusion

Traditional approaches to natural resource policy have led to the need for the development of a new policy paradigm. The Ecosystem Approach offers a holistic approach to policy development. Regardless of the policy process, a robust policy analysis framework is essential to undertaking empirical scientific study of the policy process. This chapter has reviewed two policy paradigms and provided the basis for the analysis of the policy of Yellowstone cutthroat trout that follows in chapter four.

The hypothesis statements presented in this chapter are tested in chapter four through the case study of Yellowstone cutthroat trout policy in the Greater Yellowstone Ecosystem. The data included through personal interviews and literature reviews provide the basis for the policy analysis of the Ecosystem Approach and the theories components examined in the preceding chapter.

CHAPTER IV

YELLOWSTONE CUTTHROAT TROUT POLICY IN THE GREATER YELLOWSTONE ECOSYSTEM

Introduction

The following chapter presents the data collected in support of the hypothesis statements introduced in chapter three. Historical context for the case study of Yellowstone cutthroat trout policy is provided before a review of the contemporary threats to the trout that act to influence policy. The remainder of the chapter is divided among a number of subsections that demonstrate YCT policy development in the Greater Yellowstone Ecosystem.

The data provided throughout this chapter is derived from a review of the literature surrounding Yellowstone cutthroat trout, public comments submitted to the Fish and Wildlife Service in support of the twelve-month status review of the trout, and ten interviews conducted in the summer and fall of 2006. Interviews were conducted with state and federal natural resource agency officials and conservation NGO representatives. The data is viewed through two paradigms of natural resource policy development, the traditional approach and the Ecosystem Approach. The advocacy coalition framework is used throughout the chapter to discern to what extent policy has changed and what has acted as the drivers of policy change.

Historical Threats to the Yellowstone Cutthroat Trout

The Yellowstone cutthroat trout (YCT) is one of thirteen subspecies of cutthroat trout found throughout the inland western United States.

Cutthroat trout are the only native salmonid species of the inland western U.S., but with the advancement of Euro-American explorers and settlers they are now only one of many trout species found throughout the western U.S. The historic impacts that accompanied the opening of the western frontier are not so different from today's threats to inland native trout. Stocking, habitat loss, and commercial fishing were the primary historical threats to inland cutthroat trout, and set the stage for the decline of the many subspecies.

Two facets of stocking policies in the nineteenth and twentieth centuries proved to have disastrous consequences for the native trout of the inland western United States. The first was the stocking of non-native fish into the waters of the western U.S.[1] The efforts to plant fish that brought a sense of familiarity to the landscape were ubiquitous to the extent that the efforts have been likened to that of Johnny Appleseed (Behnke, 1992). This approach saw the stocking of non-native species of trout such as the rainbow, brown, lake, and eastern brook trout, into the waters of cutthroat trout. This would prove to have disastrous consequences as non-native trout species introduced into the waters of native cutthroat trout would out compete, displace, and interbreed with native trout, including the Yellowstone cutthroat trout. Non-native trout in many waters would out compete the natives for food in streams, rivers, and lakes. It was learned early on that rainbow trout would interbreed with certain species of the cutthroat trout family producing hybrids that would much later provide a significant basis for the petition to list the Yellowstone cutthroat trout under the Endangered Species Act. A second effective ecological tool of non-native trout species is to simply proliferate so greatly that they would physically displace native species in a specific piece of habitat, which is many

[1] For an example of the scope of species and numbers of fish introduced into the Greater Yellowstone Ecosystem see Varley, John D. (1981). *A History Of Fish Stocking Activities In Yellowstone National Park Between 1881 And 1980.* National Park Service: Yellowstone National Park.

times the result with introduced eastern brook trout. Both influences have lead to the displacement of native cutthroat trout throughout their historic range.

Stocking of non-native fish did not stop after the initial introductions into native cutthroat trout waters, as non-native fish species became established in western inland waters they bred and produced 'wild' or non-hatchery raised fish. As was the culture of the time, fisheries management revolved around the enjoyment and exploitation of the resource to its greatest extent. The result was commercial and sport fishing that applied a new stress to the native fisheries of the western U.S. As a reflection of the culture, hatcheries proliferated across the U.S., with no exception in the Greater Yellowstone Ecosystem. Producing voluminous quantities of hatchery raised trout that were continually dumped into waters for the benefit of commercial and sport fisheries. This would evolve into what is known as "put and take" fishery policies whereby trout (or any other fish species desired) are born and bred in a hatchery and raised to a desired size before being released into a specific waterway with the understanding that most would be removed by anglers. A policy and management technique that continues today. With only a few fish surviving to produce wild offspring every year, state agencies are required to produce an annual crop of fish to be dumped into the waterway to support the policy and management goals. The thinking of the time was that mother nature required human assistance in the propagation of fish in waterways and that hatcheries were the answer to the deficiency. "The heavy stocking and massive hatchery programs that had grown-up all over the country since 1900 had generated a conviction that stocking was the salvation of all fishing. The notion that trout could somehow replace themselves in a stream, by the simple reproductive processes that had served so well for thousands of years, was

radical in itself" (Varley & Schullery, 1998, p. 99). But the stocking of non-native trout were not the only historical stocking policy that would prove to have negative impacts on native cutthroat trout.

Stocking of native cutthroat trout also took place as cutthroat trout were pulled from their native waters and used to stock hatcheries- this is the second detrimental facet of the stocking policy. What may be one of the most prolific hatcheries of the day was the hatchery facility found on the banks of Yellowstone Lake. At the time, Yellowstone Lake was bursting at the seems with Yellowstone cutthroat trout to such an extent that visitors to Yellowstone National Park would catch unimaginable numbers of the native trout of vast sizes simply to have their pictures taken with the fish. After the picture, the trout would usually be deposited in the nearest trash receptacle. Such was the culture of the time and fisheries management was a reflection of this culture which, in turn, was tied to the knowledge of fisheries in the day and age. The hatcheries in Yellowstone National Park, at one time numbering as many as fourteen, were in operation for fifty-seven years and it is believed that 818 million eggs of Yellowstone cutthroat were produced and distributed throughout the United States (Varley, 1981;Varley & Schullery, 1996; Varley & Schullery, 1998), an enormous quantity by any measure. "From 1905-1955, the Yellowstone Lake cutthroat trout was the dominant subspecies propagated" (Behnke, 1992: p.56) and distributed from within the Greater Yellowstone Ecosystem.

In his account of stocking policy in Yellowstone National Park, John Varley (1981) defines five distinct periods of stocking as it changed to reflect a variety of circumstances and knowledge. The five periods saw the stocking of fish in previously fishless waterways, stocking of non-native fish into native fish waters, the growth of "put

and take" stocking, and finally the stocking of fish in support of reestablishing or rebuilding of native fish stocks. A telling example of the ability of fisheries managers to adapt policy is found during Varley's defined fourth period of stocking policy taking place from 1936-1955. During this period Yellowstone National Park established a six point stocking strategy that was aggressive for its time. It consisted of "(1) Non-native fish shall not be stocked into waters containing native fish, (2) propagation of native species for stocking shall not be encouraged, (3) distribution of non-native species shall not be expanded, (4) no artificial lake or stream improvements shall be made, (5) introduction of non-native aquatic fish food organisms shall not be made, and (6) selected waters shall be left barren of fish" (Varley, 1981: p III). Together these steps produce a progressive stocking policy for Yellowstone National Park that would eventually lead to the cessation of hatchery operations in 1957 (Varley & Schullery, 1998).

While YNP possessed a stocking policy that was counter to the hatchery craze found throughout the U.S. at the time, Yellowstone National Park is a limited portion of the Greater Yellowstone Ecosystem, and the states that surround the Park each had a different stocking policy, a disparity that continues today. Nonetheless, stocking in Yellowstone National Park and within the Greater Yellowstone Ecosystem had taken place to such an extent (and continues) that while the cessation of stocking programs in YNP has undoubtedly had positive consequences, much of the damage had already been done to native fisheries with disastrous effects on native trout. No matter where stocked, non-native fish have altered the native ecosystem into which they were placed (Varley, 1981). It is believed that the effects of stocking have led to the complete loss of discrete populations of native trout species (Varley & Schullery, 1996).

Stocking was so widespread during this era that "would-be stockers had only to write their congressman or to the U.S. Fish Commission and free fish would be delivered" (Behnke, 1992). Yellowstone cutthroat trout have not been spared the devastating impacts of historical stocking policies found throughout the Greater Yellowstone Ecosystem. Stocking would produce effects decades later that would lead to the development of advocacy coalitions over the policy and management of the YCT. The displacement of the Yellowstone cutthroat trout (and many other subspecies of native cutthroat trout) from much of its historical range into relatively pristine headwaters has produced a modern association of the trout with mountain lakes and streams. A fallacy says Behnke (1992) that is the effect of the displacement of the species from its historic range along with stocking of the fish into once fishless waters. This modern view of the fish and its current habitat as opposed to its original historic distribution would prove to have profound impacts on policy, which will be explored later in this chapter.

The stocking policies of yesterday and today are a piece of the traditional approach to natural resource policy. The impacts of stocking has fostered conflict between stakeholders and produced significant stress on the ecosystem.

Contemporary Threats to the Yellowstone Cutthroat Trout

Like many species impacted by human activities, the Yellowstone cutthroat trout suffers from a number of threats throughout its range; several will be briefly explored below in order to develop a contextual map surrounding policy-making concerning the native trout. Each individual threat has a specific cause, although they may be widespread and from a number of vectors, that has typically been dealt with in a

reductionist manner and as such are a result of the traditional natural resource policy paradigm.

This section begins with the continuation of a historical threat that has already been examined- stocking. Each state within the Greater Yellowstone Ecosystem continues to maintain an active stocking program, each one consisting of different goals and activities. Largely the goal of each state's stocking policy is to support the economic activities that benefit from sport angling, although undertaken through a number of different means. Knowing the historical impacts of stocking hatchery bred fish there can be no doubt that the continued stocking of non-native fish into waters historically inhabited with YCT will continue to damage the resilience of the subspecies in the ecosystem.

Two significant developments of stocking in the waters of Greater Yellowstone are (1) introduction of non-native trout species into native trout waters which, upon becoming established become invasive, and (2) hybridization between native and non-native species that threatens entire watersheds and populations.

Behnke (1992) noted that stocking was so prevalent at the turn of the century that it is unlikely nearly any stream or lake was unaffected by the efforts to one extent or another. Current fisheries managers are highly aware of the threats posed by non-native fish stocked into native trout habitat, but are cautious to note that they must keep in mind the constituencies that support and fund state fish and game activities. Speaking about a local river that was habitat for Yellowstone cutthroat trout, one state game and fish employee offered, "If we tried to just not pay attention to something that might be occurring on the Northfork we'd be in trouble, even through primarily 80% of its

rainbow. There's not enough strong support for pure native stuff that would counterbalance the amount of backlash we would get for not doing a good active management job on rainbow on the Northfork". Current management of fisheries differs between the three states that make up the GYE demonstrates a lack of overarching policy goals. The difference between the current stocking policies of the three states vary from no stocking in moving waters (rivers and streams) as in Montana, to the stocking of sterile non-native species into native trout waters as in Idaho, to the continued stocking of non-native trout into self sustaining native trout habitat. One conservation representative had this to say about the situation, "Thirty miles away as the crow flies there's this story that's in newspapers around the world about the crash of Yellowstone cutthroat trout do to lake trout in Yellowstone Lake. Thirty miles away they're still stocking tens of thousands of lake trout on top of native cutthroat trout population." The stocking in Jackson Lake has been stopped, but it amazes nonetheless that agencies would continue to stock a species that, only thirty miles away, is decimating the world renowned Yellowstone cutthroat trout stronghold.

Several fisheries managers noted that due to historical stocking some large rivers, such as the Yellowstone River, will never be returned to a solely native trout habitat. Logistically, removing non-native species from large rivers is simply not feasible technologically and perhaps politically. Many of the famous blue ribbon trout rivers in the West are famous not for their stocks of native trout, but by the sport produced from non-native species such as rainbow and brown trout. But not all problems with stocking stem from the introduction of non-native trout into native waters. There are numerous examples of one subspecies of cutthroat trout being stocked into the waters of another

subspecies that produces many of the same problems as the stocking of non-native species of trout, including competition, displacement, and hybridization.

An example of the ability of a non-native species introduced into GYE waters that became invasive and displaced the native trout is that of the introduction of brook trout into Pocket Lake in Yellowstone National Park. In a 1983 survey of Pocket Lake no brook trout were found in the Lake; in 1996 brook trout were found and by 1997 brook trout were making up 80 percent of the catch from Pocket Lake (Koel, Arnold, Bigelow, Doepke, Ertel, & Mahony, 2005). Within less than fifteen years brook trout had gone from non-existent in the lake to become the dominate species displacing the native fish. The threats to native trout don't end with the displacing and out competing of non-native species, but continues through the hybridization between different species.

Rainbow trout are known to be able to interbreed with various subspecies of cutthroat trout and produce viable offspring that continue to breed and pollute the integrity of the native gene pool (Behnke, 1992). It was once believed that introgression between non-native trout species and introduced species was beneficial (Utah Division of Wildlife Resources, 2000), but it has since been recognized as one of the greatest threats to the resilience and long-term sustainability of native western trout (Allendorf & Leary, 1988 from Idaho Department of Fish and Game [IFG], 2005). As noted above, different subspecies of cutthroat trout are also capable of hybridizing, which further reduces the integrity of each subspecies gene pool and reduces the overall viability of each subspecies as a whole.

The tendency for rainbow trout to hybridize with cutthroat trout is so predominate in western trout waters that, in Montana, it is believed only small sections of the

mainstem Yellowstone and Shields rivers contain rainbow trout and Yellowstone cutthroat trout that coexist without substantial interbreeding (Montana Fish, Wildlife & Parks [MTFWP], 2000). The role of hybridization has become prevalent in the debate over native fish policy. Stakeholders seeking to influence the policy debate have used the hybridization issue to shape the nature of the debate for a variety of reasons. A number of outcomes that reflect the technical scope of the debate will be discussed more fully later in the chapter.

Historic and current stocking policies in the GYE have produced a number of threats to native trout species and stressors on the ecosystem as a whole. To this extent it is offered by Varley and Schullery (1998) that invasive species may be the greatest threat to native fish in the ecosystem. A final note about the effects of stocking is the concern over the loss of genetic variability produced by stocking (Behnke, 1992). This coupled with the effects of hybridization with non-native species is a significant concern for fisheries and other managers within the GYE.

For all the negative aspects of hatchery programs and stocking policies, the two can and are used for beneficial purposes. A number of hatchery operations are used to support the reintroduction and continued support of pure strain native species. An example of this is the Ten Sleep hatchery in Wyoming that was built to support the stocking of Yellowstone cutthroat trout. Hatcheries in Montana continue to augment their stocks with wild genetics in order to sustain genetic variability (MTFWP, 2000). While calls are made across the U.S. to reduce or utterly stop the use of stocking and hatchery programs, the beneficial uses of the facilities must not be overlooked in a zealous attempt to make up for the wrongs of the past, wrongs that in all likelihood will

take much longer to undo (if possible) than it took to accomplish in the first place. It seems unlikely that many would call hatcheries and stocking the great answer to fisheries management that it once was, but they may still serve a purpose in an Ecosystem Approach to fisheries management, including native fisheries.

This study is largely based on the results produced by the stocking policies of the nineteenth and twentieth centuries in the GYE. Between 1890-1941 over 17,900 lake trout of unknown age and size were stocked into Lewis Lake (Varley, 1981), and would later produce one of the greatest native cutthroat trout crises in the GYE. In 1994 it was discovered that lake trout had been illegally introduced into Yellowstone Lake, an act that was called "ecological vandalism" by Yellowstone National Park's Superintendent Bob Barbee (Varley & Schullery, 1998). At the time, the discovery would rock the native fisheries managers in the GYE as it was believed that Yellowstone Lake and its multitude of tributaries were the stronghold of the Yellowstone cutthroat trout. Knowing the damage that can be wrought by lake trout, a panel of experts was brought together to examine the possible outcomes of the introduction, none of which were pleasant in a water body the size of Yellowstone Lake (Varley & Schullery, 1995). The result of the workshop was a sense that the lake trout could not be eradicated so instead they had to be suppressed. There was also a consensus that even with this effort there would be ecological and economic repercussions throughout the region. It was identified that the establishment of lake trout in Yellowstone Lake would likely produce ecosystem level consequences (Bigelow, Koel, Mahoney, Ertel, Rowdon, & Olliff, 2003). The dire tone associated with the literature surrounding the lake trout discovery led to the hypothesis statement that the discovery was the impetus for changes in policy core beliefs. One of

the ecosystem level repercussions of the illegal stocking would be the petitioning of the YCT for listing under the ESA. The influences of the illegal stocking would prove to influence the human component of the ecosystem in addition to the ecological component. In turn, human activities would further place stress on the YCT subspecies throughout the Greater Yellowstone Ecosystem.

Due to a number of anthropogenically induced factors, habitat loss is one of the greatest threats to the long-term survival of the Yellowstone cutthroat trout. Having been pushed from many waters into high mountain lakes and streams, although as noted earlier this is not the sole habitat of the subspecies, brings to bear the emphasis placed by many on the protections provided by wilderness and roadless areas. The establishment and maintenance of undisturbed public lands are contentious in that their establishment curtails a large number of activities, many of which have traditionally produced economic benefit from natural resource extraction. Nonetheless, as Yellowstone cutthroat trout have been reduced a great extent throughout their historical range, the protections offered by wilderness and roadless areas are becoming increasingly important to survival of the subspecies. A federal management agency official noted the following role of wilderness, "In my experience in working with these cutthroat...we as a federal agency tend to look especially to federal lands and look at their condition and the status of the fish populations on those federal lands.. particularly roadless and wilderness areas."

The potential for conservation of native species (trout and others) is largely reflected in the size and location of wilderness areas (Crist & Wilmer, 2002). Areas greater than 1,000 acres are specifically important for native trout conservation, although

many roadless areas of this size are not protected, as reflected in a 2001 report by three conservation organizations, The Center for Biological Diversity, the Pacific Rivers Council, and Biodiversity Associates, whom together currently make up the Western Native Trout Campaign.

The 19 million acres of the Greater Yellowstone Ecosystem contain an estimated 11 million acres of roadless areas (Harting & Glick, 1994). Codified protection of roadless areas began following the 2001 Forest Service adoption of the Roadless Areas Conservation Rule that produced the largest volume of public comments in history. The result was an unprecedented 95 % public support for preservation of roadless areas on public lands (Cristi & Wilmer, 2002). Support of this magnitude draws into question the motivation and incentives of federal land management agencies to continue to open previously undisturbed habitat for various forms of development. Although it may be a reflection of the traditional paradigm of natural resource policy paradigm. The Roadless Rule was suspended by the Bush administration in the spring of 2005, but the decision was overturned in federal court in September of 2006. This example highlights the manner in which YCT policy extends to include a broad debate of economic, social, and political issues, which much all be considered within the context of an Ecosystem Approach.

Road building is regarded as one of the most destructive elements of development producing ecological impacts such as air and water pollution, fragmentation of habitat, overuse and overdevelopment, and providing ready inroads for allowing non-native invasive species into ecosystems (Cristi & Wilmer, 2001). Damage caused by road construction is unavoidable (Rhodes et al, 1994; Hanjun et al, 1994; NMFS 1995; USFS

and BLM, 1997a,b; from Western Native Trout Campaign, 2001) with riparian and stream damage receiving the brunt of the degradation (Cristi & Wilmer, 2001). With the benefits of large tracts of undisturbed habitat known and enormous public support for preservation of wilderness it becomes important to examine the consequences of road-building. "In 1970, the USFS identified road construction as perhaps the most serious source of damage from man's activities" (Duff, 1996 from Western Native Trout Campaign, 2001). Of those lands that have been inventoried as roadless by the USFS, 34.3 million acres of 58.5 million acres are open to development and road-building with just under three million having already been consumed by the activity (Western Native Trout Campaign, 2001).

Road construction almost inevitably produces changes in watersheds by influencing runoff. Often the results are increased frequency and magnitude of peak runoff (Cristi & Wilmer, 2001), which produces cascading consequences throughout the watershed and by extension the ecosystem. The report produced by Western Native Trout Campaign (2001) has outlined a number of indirect impacts to native trout from road construction including: increased over fishing, increased damage to riparian habitat by livestock, access for non-native fish stocking, and increased likelihood of water pollution through the release of toxins. The final and perhaps most disturbing consequence of road construction recognized by the report is the likelihood that habitat damage favors non-native species in disturbed waterways.

While road construction and the protection of wilderness and roadless areas produces conflict over natural resource policy, there is near unanimous agreement that one cause of the decline of Yellowstone cutthroat trout must be dealt with in the most

aggressive manner possible, whirling disease. Whirling disease is a pathogen that infects salmonid species and attacks the skeletal and central nervous system of fish leading to degeneration and ultimately death. The disease has proven to be highly transmittable and destructive in waterways in which it has been found; trout populations have been decimated after the diseases has been introduction into previously uninfected waters. A clear but unfortunate example is Pelican Creek.

Pelican Creek, the second largest tributary to Yellowstone Lake was found to contain sever levels of trout infected with whirling disease in 2000. In 1981 up to 30,000 YCT were believed to have traveled up the creek in order to spawn. By 2004 the spawning population had been decimated to the point that YCT population that used the tributary to spawn had been "essentially lost" (Koel et al, 2005). With the losses this high and the resulting loss of the tributary itself as spawning habitat for Yellowstone Lake's cutthroat trout, there can be no doubt that whirling disease is yet another major contributor to ecosystem level stress on YCT populations throughout the Greater Yellowstone Ecosystem.

In a final note concerning the threats to the long-term survival of the Yellowstone cutthroat trout it only makes sense to include the potential effects of climate change. Much of the Greater Yellowstone region produces a water surplus that is harnessed throughout the regions surrounding the ecosystem for a variety of purposes including agriculture and energy production. Drought is not an uncommon occurrence in the region and Yellowstone cutthroat trout and the multitude of other species native to the ecosystem have undoubtedly weathered a number of such occurrences throughout the lifespan of the species. Currently the Mountain West, with the GYE being no exception,

is gripped by a long term ongoing drought. Most droughts are tied to a variety of cycles within and outside the ecosystem, but climate change possesses the potential to produce outcomes that have no historical counterpart. Therefore it makes sense, in light of the enormous uncertainty of the situation, to craft policy that is cautious and adaptive to changing and unforeseen circumstances. How much longer the drought may last is not known, but the effects on the situation are evident in the depleted waterways of the ecosystem.

The Yellowstone Cutthroat Trout Policy Subsystem

This study of Yellowstone cutthroat trout policy is a snapshot of the period beginning in 1994 through 2006. Four temporal benchmarks were developed in order to develop a didactic devise for the observation of policy-learning in the subsystem. The four benchmarks are the discovery of lake trout in Yellowstone Lake in 1994, the original petition to list the YCT in 1998, the development and signing of the MoA in 2000, and the court ordered twelve-month status review of the YCT begun in 2004. The purpose of the four benchmarks is to provide an empirically observable framework by which policy development and change may be observed in accordance with the hypothesis statements developed in chapter three.

When it was discovered on July 30, 1994 that lake trout had been introduced into Yellowstone Lake, it was believed at the time that Yellowstone Lake and its tributaries were one of the last remaining strongholds for the long declining subspecies of native Yellowstone cutthroat trout (Varley & Schullery, 1996). The waters in Yellowstone National Park were believed to contain 91% of the current distribution of YCT (Varley & Gresswell, 1988; Gresswell, 1995; from Bigelow, et al, 2003) so it can be seen how the

discovery of lake trout in Yellowstone Lake would have been viewed as catastrophic for the subspecies as a whole, not just those found in and around Yellowstone Lake.

Lake trout are highly piscivores and are known to feed heavily on cutthroat trout when introduced into non-native waters (Koel et al, 2005; Varley & Schullery, 1998). In addition, lake trout cannot replace the Yellowstone cutthroat trout in the YCT's ecological niche in the ecosystem surrounding Yellowstone Lake; lake trout regularly inhabit deeper waters and do not move into the shallow tributaries to spawn as do Yellowstone cutthroat trout (Kaeding, Boltz, & Carty, 1995). This denies a number of species that depend on the YCT as a food source a replacement if the lake trout succeed in decimating or displacing the species throughout Yellowstone Lake. Kaeding, Boltz, and Carty (1995) recognized that this would have a significant impact on the transfer of energy between the aquatic and terrestrial elements of the ecosystem- disastrous consequences are not unease to imagine. They also noted that much of the predator-prey relationship between Yellowstone cutthroat trout and the variety of 42 species that rely on the fish as a food source, occurs in the spawning streams surrounding Yellowstone Lake. To quantify the extent to which predator species rely on the those trout that move into the tributaries imagine that Yellowstone Lake contains 124 separate tributaries of which 59 are known to serve as Yellowstone cutthroat trout spawning areas (Schullery & Varley, 1995).

Recognizing the consequence of the illegal stocking and the potentially catastrophic outcomes it could produce throughout the ecosystem, a workshop in February 1995 drew together numerous experts on cutthroat and lake trout to examine the crisis. The result was an agreement among attending experts that eradication of the lake

trout was all but impossible, but that effective intervention may only see a thirty percent loss in the Yellowstone cutthroat trout stocks in the lake. Without action it was believed that the lake's cutthroat trout population would likely decline by seventy percent (McIntyre, 1995)[2]. Obviously not a good situation for a subspecies of native trout that at the time were believed to have already been eliminated throughout 85-90% of its range.

When asked about the impact of the lake trout discovery on YCT policy in the states surrounding YNP, there was general consensus among interviewees that the discovery didn't directly impact YCT policy in their individual states. A typical comment is like the following from a state fishery manager, "Well for us it really hasn't changed [our policy], we've had an ongoing conservation program for Yellowstone cutts for quite awhile". Although, there was acknowledgement that the discovery would likely have wide repercussions. The next temporal benchmark provides support for this premise.

Table 4-1: Temporal Benchmarks

1. Discovery of lake trout in Yellowstone Lake
2. 1998 petition to list the Yellowstone cutthroat trout as threatened under the Endangered Species Act
3. The development of the 2000 Memorandum of Agreement
4. The 2000 court ordered twelve-month status review of the Yellowstone cutthroat trout.

In 1998 a number of conservation groups filed a petition with the Fish and Wildlife Service to list the Yellowstone cutthroat trout under the Endangered Species Act as 'threatened'. A number of concerns were cited in the petition with one of the greatest concerns being the discovery of lake trout in Yellowstone Lake. Following a wait of two

[2] For a complete overview of the discovery of lake trout in Yellowstone Lake, its possible consequences, and the resulting workshop see: Varley, John D and Paul Schullery. 1995. *The Yellowstone Lake Crisis: Confronting a Lake Trout Invasion.* Yellowstone Center for Resources National Park Service: Yellowstone National Park, Wyoming.

and a half years the FWS found that the request was 'not warranted' (Center for Biological Diversity, et al, v. Ralph Morgenweck, et al). The FWS decision, as much as the petition itself, lead to the development of a Memorandum of Agreement for the conservation and management of Yellowstone cutthroat trout between a number of states and federal management agencies see Appendix D.

In 2000, the states of Idaho, Montana, Nevada, Utah, and Wyoming with the federal management agencies the Forest Service, and the National Park Service embodied in Yellowstone and Grand Teton National Park's developed a Memorandum of Agreement for the conservation and management of Yellowstone cutthroat trout. The MoA laid out seven objectives in pursuit of the goal of ensuring the persistence of the subspecies throughout its range while preserving the genetic integrity and population in numbers supportive "of intrinsic and recreational values associated with the fish" (Memorandum of Agreement, 2000).

The MoA does not infringe on the mission or authority of the individual signatories, nor does it present funds for supporting cooperative initiatives in support of the agreed upon goals and objectives of the agreement. It is the latter subject which became an area of contention when those entities that petitioned for the listing of the YCT under the ESA again sued the Fish & Wildlife Service claiming the 'not warranted' decision of the agency was arbitrary and capricious. One of the reasons behind the suit was the FWS use of the MoA as reasoning for the 'not warranted' finding. The lack of binding legal authority and the voluntary nature of the MoA could not be legally relied upon by the FWS in its decision. The outcome of the lawsuit was a judicial order for the FWS to undertake a twelve-month status review of the subspecies. The decision would

result in the second possibility of seeing the Yellowstone cutthroat trout listed as threatened under the Endangered Species Act. The determination of the twelve-month status review was found again to be 'not warranted' for the subspecies, which bring the study to the present policy subsystem regarding the Yellowstone cutthroat trout. The four benchmarks outlined above provide an empirical basis for the recognition of a policy subsystem, although when the subsystem was developed temporally may be in dispute. Within the subsystem, advocacy coalitions have formed over the debate of the use of the ESA as a policy and management tool of the Yellowstone cutthroat trout. The breakout of the two coalitions is provided in Table 4-2 and are examined further in the following section.

Table 4-2: Yellowstone Cutthroat Trout Policy Subsystem

ESA Listing Coalition	Anti-listing Coalition
Center for Biological Diversity	Idaho Fish and Game
Biodiversity Conservation Alliance	Montana Fish Wildlife and Parks
Pacific Rivers Council	Wyoming Game and Fish
Ecology Center	Idaho Mining Association
Northwest Environmental Defense Center	Simplot
Biodiversity Legal Foundation	Upper Yellowstone Watershed Basin
Alliance for the Wild Rockies	Upper Shields Watershed Association
Montana Ecosystem Defense Council	Southern Crazy Mountain Watershed Group
Jacob Smith	Henry's Lake Foundation
George Wuerthner	Peggy McLeod

Source: Coalitions are comprised of groups and individuals named as plaintiffs in *Center for Biological Diversity, et al., v. Ralph Morgenweck, et al* and the explicit statement of a position in public comments in support of the YCT 12-month status review, and listed as petitioners in the Federal Register for the listing of the YCT under ESA.

The following sections continue to rely upon the use of interviews with fisheries and habitat managers and NGO representatives from the Greater Yellowstone Ecosystem and the public comments garnered for the purpose of the twelve-month status review to demonstrate shifts in the policy subsystem as well as the composition of the advocacy

coalitions within the YCT policy subsystem. Following the review of the empirical evidence will be the review of the Ecosystem Approach criteria and its application to the policy subsystem, which will also rely on interviews and public comments. It should me noted that for the purpose of this study the states of Nevada and Utah and their Yellowstone cutthroat populations have not been included, being that the unit of analysis for the study is the Greater Yellowstone Ecosystem.

The Endangered Species Act in the Policy Subsystem and Ecosystem

Although both attempts to list the Yellowstone cutthroat trout have failed, the Endangered Species Act has nonetheless had a substantial impact on Yellowstone cutthroat trout policy through a variety of means that will be examined in this section. Myriad implications concerning the impact of the Endangered Species Act arose from a review of the public comments pertaining to the petition to list the YCT under the ESA along with personal interviews with fishery managers and NGO representatives involved with conservation and management of the subspecies

The first facet to be examined is the increased coordination between management entities. Four fishery managers and an NGO representative recognized that even without a listing, the ESA has influenced the shape of policy for the Yellowstone cutthroat trout by increasing coordination between the three state fishery managers and the federal land management agencies who traditionally manage the habitat of the native fish. Coordination between the multi-level managers has been catalyzed by the ESA, codified by the MoA, and implemented in a variety of projects.

When asked about the influence of the MoA on policy there was no overall agreement as to the effect of the agreement on policy. What was recognized was the

importance of the document in codifying coordination in support of conserving the subspecies. There was also a sense that the document was catalyzed by the petition to list the YCT under the ESA and that the range-wide status assessment data that has since been produced has had a substantial impact. The individual states have each developed management programs specific to the Yellowstone cutthroat trout that reflect the goals of the MoA. The MoA has played a duel role in the policy subsystem through its development in reaction to the original petition to list the species and the use of the document as one of the subjects of scrutiny within the lawsuit that forced the twelve-month status review of the native trout. The development of the MoA and debate within the YCT policy subsystem may be said to have been heavily influenced by the Endangered Species Act up to this point. The next role of the petition to list the subspecies has potentially had the greatest impact and polarization on the temporal framework of the policy subsystem.

The example most often cited during interviews, when asked about broad spectrum cooperation among agencies is the development of the range-wide status assessment for the Yellowstone cutthroat trout, which was developed by May et al, in 2003 and was updated in 2006. This database has been hailed across the board by interviewed fishery managers, acknowledging that each state had its own method of collecting data on the subspecies that didn't necessarily match with one another prior the project was completed. Cooperation in face of the listing, admits one manager, has brought fishery managers together in a single room to talk about the subspecies across its range, something that may or may not have happened otherwise. Relating to interstate cooperation one federal official offers, "states typically do their own thing and they don't

work really well with other states. They have their own policies... they tend to manage within their state boundaries and tend not to look for interstate issues." State fishery managers and NGO representatives noted that in facing the threat of an ESA listing, money has been provided to undertake some conservation projects that likely would not have been otherwise funded. One fishery manager also noted that threats to list the subspecies has proven to increase the likelihood for cooperation with landowners in conserving the subspecies, but that there were limits to this.

During interviews with fishery and habitat managers, it was been noted by those involved with the petitioning process for the YCT that bringing together all the data on the subspecies in one place has been a positive development. It was also noted by at least two individuals involved that simply bringing information together in a consistent format that monitors the trends of the subspecies overtime is a benefit to everyone involved. It was offered that the development of the database, in addition to its function as a policy and management resource, would provide a means of accountability. The means of accountability could stem from the criteria established under the MoA or even the state management plans that were developed in line with the Agreement. Although, if trends proved to be declining rather than increasing it could have significant impacts on policy and management, includes listing of the species under the Endangered Species Act, an outcome opposed by every management agency- state and federal.

While the Fish and Wildlife Service must rely on the best scientific and commercial data available in making a decision as to whether or not a petition to list a species is warranted, stakeholders (federal, state, and grassroots) expressed a near unanimous reason for resistance to listing the YCT in both interviews and public

comments- inadequacy of the Endangered Species Act. While every fishery and habitat manager interviewed extolled the virtues and importance of the Act there was broad consensus that the Act would not provide the means necessary for effective management of the native trout if listed. A state fish and game representative had this to say, " ...with all the listed species we have adding another layer of bureaucracy to the restoration of the species does not bring an more money because so much is being devoted to the more visible species like grizzly bear and wolf. It just bring another layer of bureaucracy that's always tough to get through, even our own."

Among the reasons noted during interviews by various fishery and habitat managers for the inadequacy in ESA's ability to increase effective policy and management of the fish where loss of cooperation from private landowners who volunteer to support conservation, a burdensome increase in bureaucratic red tape that would inevitably stymie conservation efforts, and a lack of knowledge by many, but by no means all, FWS personnel with the specifics related to the species. One state fish and game official offered, "We think, and this is the state's way of thinking, that we can do a better job of managing, enhancing, and restoring the species than a federal agency can... by statute this is our job." Many managers also noted that the FWS is chronically under funded and this, at the least, inhibits conservation efforts, something that some noted is related to the politics of specific administrations. Simply listing the species does not bring anymore money to conservation of the species. Another issue that arose was inconsistency across FWS regions in their approach and application of the Act; the Greater Yellowstone Ecosystem resides in region six known as the Mountain-Prairie Region.

NGO's that are involved in attempting to influence Yellowstone cutthroat trout policy are not unanimously supportive of listing the subspecies under the ESA either. One representative questioned how effective the ESA would be in dealing with lake trout in Yellowstone Lake or the issue of hybridization. What can the Act do to suppress lake trout this is not already being done, especially acknowledging the limited funds of the FWS? Another representative noted that the ESA has not had a good track record in recovering listed fish species, even in Montana.

Three local level watershed groups along with a private citizen involved in one of watershed groups voiced concern in their public comments that the ESA was inadequate to support conservation of the YCT. In there comments submitted to the FWS each acknowledged the role of local volunteer conservation efforts and cooperation between different levels of government. Each also worried that a listing of the subspecies would inhibit continued cooperation between the local conservation groups and state and federal management entities. To what extent this would prove to be true cannot be ascertained, but it is important to note that concern over inadequacy of the ESA to offer a positive substitute to current conservation efforts is spread throughout the region from local to federal levels.

The Idaho Mining Association (IMA) and Simplot, an agribusiness corporation, relying on a review of information pertaining to the YCT since 1998 by an employee of BioAnalysts Inc. opposed the listing of the native trout in their comments submitted to the FWS. Both IMA and Simplot, through the BioAnalysts report, opposed the listing on the basis that such a listing of the YCT subspecies would negatively impact conservation of the trout rather than bolster it (House). The report relies on the MoA and the funding

of the fisheries program in Yellowstone National Park as the basis for the claim that listing under the ESA would hinder conservation rather than support it.

It was felt by some interviewees involved with the Yellowstone cutthroat trout that part of the inadequacy of the ESA stems from the lack of a substantive empirical or quantitative threshold for judging a species to be endangered to the extent that it should be listed as 'threatened' or 'endangered'. The lack of a threshold for judgment on a species makes the process subjective even though it relies on the best available science. But the best available science does not necessarily provide the Fish and Wildlife Service a tool with which it can present petitioners (or in many cases the Courts) that empirically identifies the need or lack thereof for protection under the ESA. The subjective nature of the petitioning and review process, while supported by solid science, allows for disparate interpretations and application of the Act. In the case of the Yellowstone cutthroat trout one NGO representative noted that in a discussion with FWS personnel it was admitted that the Yellowstone cutthroat trout was in greater peril than the bull trout when it was listed under the ESA. This example relates to the concern over the lack of a threshold, but Idaho Fish and Game, in their comments submitted to the Fish and Wildlife Service, presented quantitative criteria for listing a species developed by Mace and Lande (1991).

Although the petition to list has been denied twice, fishery managers and NGO representatives alike have recognized the leverage produced by a *threat* to list the species under the Endangered Species Act. Fishery managers and NGO's have expressed that a threat of an ESA listing of a species brings about a number of positive reactions that may actually prove more beneficial than an actual listing. Many noted that the threat of listing a species acts as a motivator for departments and agencies to undertake coordination

between one another and substantive steps toward conservation of the species. This has proven to be the case with the Yellowstone cutthroat trout. Five fishery and habitat managers and two NGO representatives believe that the petition to list the YCT acted as enough of a threat to produce tangible conservation efforts and cooperation between management entities. A conservation NGO representative offered, "... the optimal situation is a perpetual listing decision hanging over your head cause it motivates people to act... that's like kinda your optimal situation, is perpetual tension." While the motivation to act under the threat of an ESA listing appears to be broadly accepted, the perceived reasons for the actions are very different.

More than one individual cynically noted that the purpose behind actions instigated after the petition to list the YCT were motivated less out of desire to increase conservation efforts for the trout than to keep the federal government in the guise of the Fish and Wildlife Service from taking over management actions. This is not to say that previous and continued conservation of the fish were simply self-interested acts by the states. Rather, the belief is those agencies already committed to fishery and habitat management are better equipped to manage the species than the Fish and Wildlife Service, for a variety of reasons which have been noted above. Another view of the situation is that the states utilize the threat of an ESA listing as a tool to force private landowners into cooperation with the states for the means of conservation. The argument offered by one individual was that the states use the threat of a listing as leverage to bring about the cooperation of private landowners by stating that the alternative will be the involvement of the federal government which will be much less amenable or forgiving in their actions.

Although some are cynical in their view of utilizing the threat of an ESA listing as a policy tool, others believe that it can be done with care and good intentions. An NGO representative offered that the optimal situation for continued conservation is perpetual tension placed on management agencies resulting from the threat of a listing. One fishery manager, after speaking with those organizations involved in the petition to list the YCT, noted that one of the drivers behind the petition was to bring people together to work cooperatively on solving the problems associated with the long-term survival of the Yellowstone cutthroat trout.

The discovery of lake trout in Yellowstone Lake has catalyzed a number of policy debates, mechanisms, and activities among both sides of the policy subsystem. The data begins to raise questions about how much the discovery influenced an already established policy subsystem or, as may be the case, acted as the catalyzing agent for the development of a new policy subsystem following the loss of the YCT's "stronghold" in Yellowstone Lake.

A critical element to the listing process for both sides of the policy subsystem and the debate has been the role of technical information, namely in the form of the range-wide status assessment and the role of hybridization in understanding the ecology of a species. Both components are important to the advocacy coalition framework and the Ecosystem Approach for reasons and implications that will be examined in the following section.

The Role and Influence of Technical Data

The role of technical data, information that requires interpretation in order to be consumed by laypersons, has been identified by the advocacy coalition framework as producing significant impacts on belief systems, advocacy coalitions, and policy subsystems. In the case of the of Yellowstone cutthroat trout in the Greater Yellowstone Ecosystem two interrelated forms of technical data have influenced the debate to an extent that it can be said to have been a causal factor in the formation of the advocacy coalitions found within the policy subsystem. The range-wide status assessment developed by May, et al, (2003) has served as a bulwark for both sides of the listing debate. In question is the extent to which the YCT continues to inhabit its historical range. The second component of this debate is based on the question of what is a Yellowstone cutthroat trout? To most observers the answer lies in the phenotypical display of the native fish, but this is only part of the answer when examined within the policy subsystem. The extent of hybridization, its effects on YCT populations, and the extent of introgression that must have occurred before a Yellowstone cutthroat trout is no longer considered a Yellowstone cutthroat trout but a hybrid, lies at the heart of this debate. The debate between the coalitions over the extent of the current range of the YCT and the issue of hybridization will both be examined herein.

The Debate of Distribution and Hybridization

In the Greater Yellowstone Ecosystem, Yellowstone cutthroat trout serve as both a keystone and indicator species (Varley & Schullery, 1996), and a food source for up to 42[3] different species within the ecosystem (Varley & Schullery, 1995; Varley &

[3] For a complete list of known and suspected bird and mammal species that prey on the Yellowstone cutthroat trout see Appendix C, a table from Varley, J.D. & Schullery, P. (Eds.). (1995). *The Yellowstone Lake Crisis: Confronting a Lake Trout Invasion.* Yellowstone Center for Resources: Yellowstone National Park, Wyoming.

Schullery, 1998; Koel, et al, 2003). The large number of species that depend on the YCT as a food source range from common to endangered birds including the osprey and the bald eagle and from small to large mammals ranging from the deer mouse to the endangered grizzly bear (Schullery & Varley, 1995). Given the wide range of species that depend, to varying degrees, on the YCT as a food source, there is no wonder that the trout is believed to be a keystone species within the ecosystem and an indicator of ecosystem health. The case for the species as an indicator becomes amplified when considering that Yellowstone cutthroat trout have historically inhabited the waterways of the Greater Yellowstone Ecosystem since at least the last glacial period (Behnke, 1992).

The historical distribution of the Yellowstone cutthroat trout has consequences for the shaping of future policy. Understanding the historical distribution of the fish provides policy-makers and stakeholders alike with a tool in shaping future policy of the fish by providing context to policy-making that is ecologically rational. It is for this reason that something as seemingly innocuous as the distribution of the fish during Euro-American exploration of the West can have a dramatic impact on future policy.

Experts have recently begun to differ in there belief of what historically constituted the range and distribution of the Yellowstone cutthroat trout. A recently completed range-wide status assessment of the YCT (May, 2003) changed the nature of the debate through two important means related to the historical range of the fish. First, May (2003) begins by establishing the historical reference point for measurement of the trout's range approximate to the time of Lewis and Clark's Corp of Discovery expedition, which was developed in an earlier inland cutthroat trout assessment developed by May in 1996. This provides a benchmark that begins to develop empirical data for the range of

the fish, if only qualitative in basis. Robert Behnke, considered by many as the foremost expert on western native trout, in his 1992 publication on the subject used a historical reference related to glacial periods in history. Many authors and researchers, as noted by May in his range-wide status assessment, have relied on the work of Behnke for further developing an understanding of the range and distribution of Yellowstone cutthroat trout. By reducing the scope of time in which the potential range of the YCT is considered it greatly reduces the flexibility for which the range of the trout may be considered. That is to say, that by tying the historical distribution of the trout to the time of the Corp of Discovery, policy-makers are no longer obliged to develop conservation policy that reflects a larger distribution of the fish from a more dated temporal scale, which may or may not be to the benefit of specific stakeholders or the subspecies itself.

The second aspect by which the May (2003) status assessment changed the nature of the debate is by actually reducing the historical range of the fish in relation to the historical range identified by Behnke. This may be related to the historical benchmark which May has chosen to use as his historical reference point. Nevertheless, as noted in the paragraph above, reducing the historical range of the fish produces potential consequences on future policy-making. The historical range identified by the May (2003) range-wide status assessment concludes that the historical range of the Yellowstone cutthroat trout consisted of approximately 17,400 miles of water. As noted by May, this is a considerable reduction of the range as specified by Behnke (1992) that, while not providing specific quantitative data relating to the range of the YCT throughout previous glacial periods, maintains the trout's historical distribution throughout the Snake and Yellowstone river drainages. Admittedly, May has excluded many of the waters

believed by Behnke to have once been populated by Yellowstone cutthroat trout for a variety of reasons[4]. With the historic distribution of the Yellowstone cutthroat trout unresolved, the current range of the fish has also been called into question.

Prior to the 2003 range-wide status assessment it was believed that the range of the YCT had been reduced to only 10-15 % of its historic range (Varley & Schullery, 1996; Varley & Schullery, 1995) with 91% of that remaining in Yellowstone National Park (Schullery & Varley, 1995). In contrast the May (2003) survey offers that the YCT continues to inhabit 43 % of its historical range, although only 17 % is believed to be pure strain, non-introgressed Yellowstone cutthroat trout- a wide disparity. May (2003) notes numerous reasons for the potential discrepancy between his study and those of previous researchers which include, the scale of maps used, lack of data, sampling techniques, and the potential that counting (or not) of hybrid's may have influenced the outcome. It is important to note that another reason for the disparity may have come from the definition of the historical range, which may have influenced the outcome of the current range.

The ecological role and the historical and current distribution of the Yellowstone cutthroat trout each provided important dimensions to the policy process, especially when viewed through the lens of the Ecosystem Approach. Being a keystone species and seeing the reduction of the native trout throughout its habitat, whether it has been relegated to 10 or 43 % of its historical range, has undoubtedly had impacts throughout the ecosystem to include the human component. Both the root causes for the loss of the

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[4] For a complete review of the distribution of Yellowstone cutthroat trout as seen by Robert Behnke (1992) see *Native trout of western North America.* American Fisheries Society Monograph 6. American Fisheries Society: Bethesda, Maryland. For the counter theory proposed by May et al, see- May, Bruce E., Urie, Wendi, and Shepard, Bradley B. 2003. *Range-wide Status of Yellowstone Cutthroat Trout (Oncorhynchus clarki bouvieri)*: 2001. Bozeman, Montana: U.S. Forest Service.

species throughout its habitat and the effects of the diminishment in the ecosystem must be accounted for if policy is going to remedy the causes of stress rather than the symptoms produced.

The debate over the current range of Yellowstone cutthroat trout begin with the public comments submitted by the states of Idaho, Montana, and Wyoming. All three states relied on the work of May, et al., (2003) to support their argument that listing of the native trout was not warranted under the conditions established by the ESA. In the range-wide status review May et al., (2003) established that Yellowstone cutthroat trout continue to inhabit 43 % of their historical habitat. Building on the statistic, Idaho Fish and Game argued that the current range and genetic composition found therein did not preclude the need for an ESA listing. Montana Fish Wildlife and Parks went on to include statistics that supported the current conservation effort noting 70% of the population was found on federally managed lands with 40% in roadless areas and another 19% in wilderness areas. The point being that such areas offer a greater level of protection to the subspecies. Wyoming Game and Fish, in repudiation that the threats to the YCT 'stronghold' of Yellowstone National Park were a cause for listing, offered that the waters in YNP contained only 8.5% of the current range of the YCT and that "if YNP were removed from the picture, there is no reason to believe YSC [Yellowstone cutthroat trout] would go extinct"(Wyoming Game and Fish Department, 2005).

The three states were not alone in their use of the May, et al (2003) study. The Idaho Mining Association and Simplot both utilized the study to argue against listing through the report developed by BioAnalysts Inc. The Henry's Lake Foundation also relied on the data to offer that the Foundation believed loss of habitat as presented by the

petitioners was not reflected in the findings of the status review and led to a gross exaggeration of the threats to the YCT.

The proponents of a listing for the Yellowstone cutthroat trout also relied on the data collected by the May, et al (2003) status review, but came to an altogether different conclusion than the states and their supporters. The Center for Biological Diversity (CBD) begins by asserting that the 43% of the habitat still inhabited by the YCT are in actuality inhabited by a mix of pure and hybrid specimens. They go on to present from the 2003 report that only 17% of the current range of the YCT contain pure, non-introgressed populations of the native trout, which is only 7.5% of the trout's historic range. They continue their argument that of those populations that have been found to be pure only a small fraction of them are not endanger of future hybridization, along the lines of 5% of the current range which equates to 2% of the historical range. The group argues that of the historic and current ranges presented by May, et al (2003) 17 % of the historic range and 40% of current of the YCT are only "suspected unaltered" by hybridization, implying that the methods used by the researchers does not err on the side of caution, which would support the need for a listing with a much reduced current range of the trout. The CBD is not alone in its use of the range-wide status assessment as a tool to support listing of the YCT. The Northwest Environmental Defense Center (NEDC) also utilized the findings of the report to support their argument that the Yellowstone cutthroat trout was warranted a listing under the ESA for many of the same reasons as the CBD.

The disparities in the interpretation of the data presented by the range-wide status assessment presented above is only a portion of the arguments offered by each side of the

debate and do not reflect the entire scope, but rather offer a relevant example of the means through which technical data is utilized by opposing sides of a conflict. In this case both sides have relied upon the same data, but with different interpretations that support their own perspective on the listing of the Yellowstone cutthroat trout. The debate does not end simply with discrepancies found in calculating the historic or current range of the fish. Rather, the debate revolves around the issue of hybridization and what is a Yellowstone cutthroat trout and when does interbreeding result in a YCT no longer being a YCT? While the states have produced a policy for the recognition of a pure cutthroat trout versus a hybrid[5], too much contention still exists as to a definitive and ultimately, enforceable identification scheme. The ultimate consequence of the decision may well determine the current range of the Yellowstone cutthroat trout and may serve to produce a wildly different map than has been presented thus far.

The debate over the issue of hybridization is not limited to the Yellowstone subspecies of the inland cutthroat trout, but is highly debated for a number of other subspecies as well. The implications and decisions may prove to have consequences for a number of subspecies of cutthroat trout throughout the interior West.

Ecosystem Approach Analysis

The criteria outlined in chapter three, Table 3-1 established a framework by which natural resource policies and programs may be evaluated in the context of an Ecosystem Approach. The following sections will provide evidence to the extent to which the

[5] The work currently guiding the states of Idaho, Montana, and Wyoming on the role of hybridization in Yellowstone cutthroat trout policy is- Utah Division of Wildlife Resources. (2000). *Cutthroat Trout Management: A Position Paper, Genetic Considerations Associated with Cutthroat Trout Management.* Salt Lake City, Utah: Utah Division of Wildlife Resources.

policies and programs in place for the Yellowstone cutthroat trout meet the criteria for an Ecosystem Approach.

Fishery managers for all three states that contain a portion of the Greater Yellowstone Ecosystem noted during interviews that they each had policies in place to manage the YCT long before the discovery of lake trout in 1994. In Idaho it was noted that regulations for certain waters, such as the South Fork of the Snake River, have sought to protect and promote native species. In Wyoming the Game and Fish Department has undertaken stream surveys in the 1970's and 80's to discern where Yellowstone cutthroat trout and rainbow trout overlap. In Montana, one fishery manager noted that there have been ongoing efforts for sometime to protect the YCT through methods such as eradicating brook trout and brown trout that compete with Yellowstone cutthroat trout. These are just that, examples of steps taken by the three states to implement policies that manage the YCT.

The pre-1994 efforts to protect the native trout were not limited to the states agencies of Idaho, Montana, and Wyoming. The National Park Service, and the Forest Service also were involved in efforts to protect the trout prior to the discovery of lake trout. The NPS, after recognizing the dangers and consequences of stocking non-native species embarked on a policy of protecting native fish species. In Yellowstone National Park this meant the cessation of stocking in the Park in1957 and the use of piscicide to remove non-native trout species from Yellowstone Lake tributaries in the 1980's. For the Forest Service much of the early efforts may have been the result of managing the stream and lake habitat targeted by the GYE states for protection of the Yellowstone cutthroat trout.

The Impacts of Sport Fisheries

While fisheries managers all extol the extent to which their organization have sought to protect the YCT prior to the petition to list the fish in 1998, others are skeptical as to the extent to which the efforts were truly aimed at protection of the native trout. One federal level official noted that the states have a responsibility to manage Yellowstone cutthroat trout for economic reasons in addition to any concern for conservation. Due to the recreational fishing that surround the Yellowstone cutthroat trout and many times the non-native species that inhabit the same water, the states manage the fish in many waters mainly for the benefit of recreation. This of course adds an economic dimension to the issue.

One state fishery manager offered that the fact that the YCT is a game fish adds support for conservation of the subspecies. A second fishery manager offered that conservation of the fish through the use of regulations has enhanced the blue-ribbon fishery in the Snake River, and also agreed that the recreational fishery added support for the desire to conserve the species. In Wyoming, the state has developed a "Cutt-Slam" program that couples recreational fishing with developing knowledge about the state's cutthroat trout subspecies. The program challenges those interested to catch and photograph one of each of the four cutthroat trout subspecies found in the state, then upon having done so submit the photos of each and in return the individual receives a certificate recognizing the achievement.[6] It is highly important to note that much of the money that funds the activities of the state game and fish agencies comes from the sale of

[6] For an in depth description of the Wyoming Cutt-Slam program see the Wyoming Game and Fish website found at http://gf.state.wy.us/services/customers/cuttslam/index.asp.

hunting and fishing licenses. This adds yet another economic, but not altogether separate dimension to the policies and management of the YCT.

While state game and fish agencies rely on the money they receive from the sale of fishing licenses to take on many conservation project for native species, money must also be used to support recreational fisheries. Many of these fisheries are those that have been developed over time through the stocking of non-native trout species and as one fishery manager noted, at least some of the agency's attention and efforts must be dedicated to supporting the recreational fisheries even if it is not what is best for native species. This is one of the requirements that has developed through the reliance of funding on fishing licenses. While some would like to see game and fish departments focus most, if not, all of their attention on native species and their conservation, it simply isn't feasible politically.

In addition to the states, the sport fishing public is important to the conservation of the Yellowstone cutthroat trout in the eyes of NGO's. The YCT inhabits some of the most famous blue-ribbon trout rivers, streams, and lakes in the world. The fame of the waters they inhabit help to funnel attention to the subspecies and some non-profit organizations such as Trout Unlimited draw constituencies from the public that fish those waters. In turn, Trout Unlimited has worked with the states in the GYE to protect the YCT through means such as habitat improvement and acting as a link between agency officials and private landowners. The more broadly focused non-profit organization, the Greater Yellowstone Coalition has also recognized the importance of the recreational fishery aspect through the amount of money generated through recreational fishing. These two examples do not speak to the full spectrum of NGO's that are involved in

attempting to shape YCT policy, and while they agree with the states as to the importance of support for recreational fisheries, they do not necessarily agree with the policies that support the recreational fisheries. One NGO representative believes that the reliance of conservation on fishing regulations has become overly complicated and will serve only to confuse a well intended fishing public. Much of the recreational fishing takes place on public land managed not by the states, but by the Forest Service and the National Park Service.

Public Land Management

The role of public land management in the debate over Yellowstone cutthroat trout policy is contentious for many of the same reasons that it is for other species whose range resides on public lands- economics. Federal and state agency officials are aware that protection of any species can mean the loss of a portion of land from a more traditional usage, such as livestock grazing. This is exactly the case for Yellowstone cutthroat trout as a large percentage of the YCT habitat can be found on public lands. As throughout the Mountain West, much of the public land has traditionally been utilized for economic benefit through extractive industries whether it be from logging, mining, livestock, or any other activity that has been historically allowed on public lands. Agency officials believe that traditional users fear a listing of the YCT would preclude traditional users from undertaking their traditional activities. Ranchers fear that a listing would take away their grazing rights on public lands, noted two state fishery managers. Chapter three made the case that public land agencies have a constituency that is comprised, to a great extent, from extractive users of the lands.

A listing of the YCT would potentially put the federal agencies at odds with the needs of their historical constituency. But there is also a broad recreational constituency component associated with public lands that would also be impacted by a listing of the native trout. At this point one can only speculate as to what the outcome may look like if the fish were indeed listed as threatened or endangered under the ESA, but there can be no doubt that it would impact both user groups. It is hard to project to what extent each one would be impacted, but the reliance of cattle on waterways leads one to presume that a listing may well be devastating to grazing in the area. One state fishery manager stated that when trying to implement conservation activities on public lands there is a high level of suspicion by ranchers that the agencies are trying to take away their grazing rights without the use of the ESA. The state fishery manager asserted that in reality what they are attempting to do is undertake well constructed, documented conservation efforts that will prevent a listing of the YCT in the future. "We are not trying to take their grazing rights away," states one state fishery manager, "we want to try to get them to do a better grazing regime this is going to protect the riparian area." The same official goes on to say, "The private land owner, I think for the most part, is worried about listing because they think it might impact their livelihood." Nevertheless, there exists an undeniable tension between state and federal management agencies, resource users, and groups that seek to influence public land policy. The tension and conflicts that are produced take place in a subfield of public lands that are made up of wilderness and roadless areas.

This serves as an example of the need for an ecologically rational policy apparatus driven by overarching, broad-based, ecosystem goals. Such a framework would serve to potentially produce a win-win outcome between YCT conservation and

public land users by identifying areas where traditional activities are/are not compatible based on objective criteria. One example is the establishment of grazing allotments that are inline with the overarching policy goals of the ecosystem based on best management practices within prescribed, predetermined areas.

The importance of wilderness and roadless areas to the conservation of the YCT were addressed earlier in this chapter, so they will not be readdressed here. State agency officials, federal agency officials, and NGO representatives all recognize the importance of the YCT populations found in those areas protected through wilderness or roadless designation. There was general consensus among those interviewees who addressed the issue that habitat found in wilderness and roadless areas are in better condition than those found elsewhere on public lands or on many private lands. This places the protection of those habitats as important to the different agencies and NGO's for differing reasons. So while the different groups may have differing goals in mind for the subspecies, there seemed to be no doubt among those interviewed that the habitat found in areas protected on public lands by wilderness and roadless designation at least partially served to rebuke the petition to list the subspecies under the ESA.

Private Property

In keeping with the Ecosystem Approach, public land cannot be the only habitat considered under the framework. Private property and the political, economic, and social impacts and interactions produced through its existence must also be examined within the context of the larger ecosystem. Views on the role of private property and conservation of the YCT in the Greater Yellowstone Ecosystem are conflicted. Some state agencies perceive landowners being offered incentives to prevent conservation on their land

because the landowner believes that the result will be the loss of the use of his land. One state agency official related that when attempting to persuade one rancher to cooperate with the state in undertaking conservation activities on his land the rancher feared the result would be that he would no longer be able to graze his cattle along the stream- the stream on his ranch. But not all the agencies involved see disincentives for landowners to become involved in conservation practices.

State and federal management agencies recognize that private property which resides in the lower elevation of the YCT range usually contain waters that are being impacted by a host of compounding problems that prevent effective YCT conservation that extends beyond the waters found on the private land in both directions. Nonetheless, a conservation NGO representative offers, "One of the major reasons why we work on private lands is because riparian corridors are incredibly important in the arid West for both fish and wildlife. If you can't work with private landowners and work with local governments to protect private lands you're not going to get the job done as far as protecting fisheries."

A number of interviewed agency official saw benefits for private landowners to undertake conservation on their land in order to avoid the more draconic and invasive actions that would be placed upon them in the event of an ESA listing of the Yellowstone cutthroat trout. A state fishery manager offered, "if you take away the specter of an Endangered Species Act listed fish it certainly helps get cooperation from private land owners more so than if the fish is listed." A limited number of agencies convince landowners to cooperate with a sort of preemptive move to conserve the fish by choice rather than obligation. Not all the agencies or NGO's believe that this is the correct

means to seeking cooperative engagement with private property owners. One NGO see's efforts to frame the debate as the state and private property owner against the federal government as detrimental to the larger effort seeking to implement native trout conservation.

Numerous state and federal management agencies and NGO's extolled the use of a Fish and Wildlife Service policy that seeks cooperation between private landowners and management agencies for the conservation prior to the listing of a species under ESA- the Candidate Conservation Agreement with Assurances. The CCAA allows a private landowner to undertake on-the-ground quantifiable actions to preserve a species on their land even through it has yet to be listed as threatened or endangered under the ESA. In return for cooperation in conserving the species the landowner does not need to fear being subject to increasing restrictions on his property in the event that the species is listed. The benefits of this tool have been praised by management agencies and NGO's alike. During interviews it was revealed that CCAA's have been utilized to implement conservation activities focused on the Westslope cutthroat trout subspecies, but at the time of the interviews it was believed that there had not been any case where landowners had undertaken cooperative opportunities in the context of YCT conservation. Nonetheless, it was believed by many government and NGO representatives that the YCT stood to benefit from efforts to implement a strategy utilizing the CCAA as a means of fostering support for YCT conservation in the Greater Yellowstone Ecosystem.

Although some landowners perceive disincentives to undertake voluntary conservation measures on their land, there are private property owners who do seek to voluntarily undertake fish conservation on their land. But as noted during interviews by

agency officials and NGO representatives it can be monetarily unfeasible for private property owners to undertake voluntary conservation for a variety of reasons. The lack of money to undertake meaningful conservation is where NGO's see themselves as having some of their greatest leverage and success. Not only private landowners fall short of funding, management agencies do as well. There are times when NGO's such as the TU or GYC can bring funding to bear in order to undertake conservation activities that otherwise would not have been possible on both private and public land. One NGO representative viewed non-governmental organizations as serving as a bridge between management agencies and private property owners by bringing credibility to the table, which is developed, in the words of one representative, through the mouth-to-mouth networking that takes place between land owners. On the management agency side, the NGO's see themselves as bringing political support to bear, largely through grassroots support and at the same time helping to find money for specific agency desired conservation projects.

While stakeholders may not agree on the role of other stakeholders involved, there is no doubt that it is important to management agencies, state and federal, and NGO's that efforts be made to conserve YCT and their habitat on private lands. Much of this stems from the desire to see populations connected into larger metapopulations. Such an achievement would increase the stability and robustness of the subspecies throughout its range more so than individual populations residing in small portions of disconnected headwaters. In order for this to happen restoration efforts must take place in the lower elevation habitat of the YCT, much of which is found on private property.

The example of the CCAA might paint a picture of state game and fish agencies, federal land management agencies, and non-profit conservation groups as actively coordinating to achieve overarching goals. While this may be true in some instances, it is the exception rather than the norm. When asked whether all stakeholders have been brought to the table in the context of Yellowstone cutthroat trout policy and management, the inconsistency in answers is astonishing.

Broad-based Participation

Each state and federal agency and NGO characterized the relationships between one another in the widest possible spectrum. Numerous individuals claimed that there was little or no cooperation between state and federal entities, while others claimed the cooperation was great. A conservation NGO official noted the following about federal and state cooperation, "Our state department here, I know it's the same in Idaho, our Fish, Wildlife, and Parks department does not like the Forest Service telling them how to manage fish species or populations of fish species on federal land, they're adamant about it. In fact they're rabid." Yellowstone National Park saw itself separate from the disagreement that take place between the states and other federal management agencies because it manages both the fish and the habitat. This has led one interviewee to question whether the Park is in the loop on decisions concerning the YCT outside the Park's borders. Although the disparity between perceived effectiveness in cooperation was vast, there was a general consensus that a rift existed between field staff/biologists and leadership to include political appointees, especially in federal agencies. The consensus saw the field staff as striving to cooperate and implement conservation efforts, while efforts were stymied at higher levels in the various agencies. This problem led one NGO

representative to state that agency staffs, while striving to do the right thing, are not always free to do so, therefore stating, "we've got to create the political environment for them to be able to do the best job they can do."

When it came to the involvement of non-management stakeholders, one NGO claimed that they were left out of the decision making process and largely lacked a seat at the table. This is in contrast to another NGO that believed an invitation had been offered to all interested parties to sit at the table. So like the discrepancies in the state and federal relationship above, it is hard to discern to what extent other stakeholders may be involved. Involvement is of course subjective and contextually driven and this may have led to a disparity in perceived involvement, with the implication being a lack of communication between all entities.

One particular example does reflect the collaboration between federal management agencies and regional conservation NGO's. Following the discovery of lake trout in Yellowstone Lake it was decided that the policy for combating the introduced non-native trout would be through an extensive netting campaign. Funding for staff, nets, and the boat to conduct the operation was originally funded through a federal grant, but after only a few years the money was scheduled run out. NGO's with diverse backgrounds and goals, including Trout Unlimited and the Greater Yellowstone Coalition, coordinated to lobby Congress to provide continued funding for the netting program, which ultimately proved successful. There are two important aspects to this. The first was the need for the management agency to seek stakeholders from the ranks of NGO's to assist them in accomplishing their goals. This is not an altogether rare occurrence, in fact there are NGO's whose sole purpose it to support the National Park

Service, but the importance comes from the context of the situation. Yellowstone National Park, considered the crown-jewel of America's National Park system, had to rely on the lobbying efforts of conservation and sport fishing NGO's in order to simply maintain the status quo in the Park. YNP was not seeking to embark on a new and innovative method of lake trout removal, but rather was simply in need of funds to continue to hold the line against the lake trout and the probability that the inability to do so would unravel the unique ecosystem in the Park and beyond.

Coordination, seen through the lens of the Ecosystem Approach, requires not only coordination between management agencies at all levels, but also stakeholders, to include grassroots stakeholders. Does this example illustrate such an example? No. But what it does illustrate is the need within the ecosystem for just that sort of cross-boundary and cross-sectoral coordination. In many ways the issue becomes one of political will.

Perceptions of effective involvement between states, federal agencies, and NGO's is disparate at best, but a consensus was reached again when it came to public participation. The general agreement amount the management entities and NGO's was that there was a lack of public participation, along a variety of fronts. In the face of this understanding was also an agreement that effective long-term policy and management of the Yellowstone cutthroat trout in the Greater Yellowstone Ecosystem must include participation of the broad public, although who the public would consist of was debatable. Many, but not all saw the answer to this dilemma as partly due to a lack of public education and partially resolvable through a public education effort, although others were skeptical.

Recognizing the need to educate the public with regards to fisheries, native and non-native, the states have embarked on efforts to engage the public. Idaho has a trout in the classroom program that includes field staff going into the schools and talking to children. Wyoming has put together an annual hunting and fishing expo with one day being primarily dedicated to teaching the children about conservation and other important topics related to the multitude of species in the state. Montana utilized a steering committee when developing its statewide conservation agreement. With concern to efforts specifically targeted at educating the adult public about native trout issues one issue of concern rose to the top, the conservation of native vs. wild trout.

Some agency officials and at least one NGO representative are skeptical of the extent to which public education is the answer to solving the problems surrounding the Yellowstone cutthroat trout. Nevertheless, the debate between the conservation of native fish and the support of wild fisheries, which may or may not be populated with native species, is of great importance to management agencies and NGO's alike. Interviewed state agency officials acknowledged a lack of education within the public as to the difference between native species and wild species. One fishery manager noted, "even internally we have people who use the two terms interchangeably". This reveals the need to, at the least, expand education programs that recognize the differences between native and non-native trout in the individual states and the ecosystem as a whole. A second aspect of this debate falls within the recreational fishing public.

The agencies and NGO's both acknowledged that a schism exists between a portion of the fishing public. One segment wishes to see the conservation and extension of native trout and their fisheries. A second segment is concerned with the experience of

catching non-native trout in the GYE for, what is considered among many circles, a greater sporting experience. What makes the blue-ribbon waters blue-ribbon in the GYE are many times not the native cutthroat trout subspecies that inhabit the water, but the harder to catch and harder fighting introduced non-native species. In many ways this cleft becomes a part of the economic issues that surround conservation of the YCT and the need to manage for conservation and recreation. Part of the argument is indeed economic in nature, but as noted by agency and NGO's much of the argument is ecological and related to the different niches held by native and non-native species. The question becomes, where are the two compatible and where are they incompatible?

Political Will

Conservation of Yellowstone cutthroat trout, as has been demonstrated throughout this chapter, becomes a political issue along a number of veins. Whether its property rights, jobs, recreation, or any of the host of other issues that relate to the seemingly discrete issue of YCT conservation, a decision related to values must eventually be made, and this eventually leads to the role of politics. This is not lost on agency officials at any level of fishery or habitat management. Tradeoffs and alternatives exists for each decision that is made, but while the agency officials are aware of it, it is the NGO representatives that are perhaps the most actively seeking to broaden the field in which decision-making is played out.

One NGO representative offered that in many ways the agency officials that recognize the correct decision that should be made, not only because it make sense ecologically, but because it would likely prove beneficial along other routes as well, are shackled from doing so by politics. It has been well debated that expert management

alone does not solve the problems related to natural resource management, but there appears to be a sense that in the GYE politics from outside the region (from political appointees) have more control over decisions than may be warranted. It is in this light that the same representative, who like others believe largely that management agency staffs are almost always seeking to do the right thing, stated that this lack of political will requires NGO's to enable the agencies to do their job, at least in some circumstances. A conservation NGO representative offered the following, "I think these agency biologists are being put in very uncomfortable positions and they're having to make decisions that they themselves don't like. I view that as one of the major jobs of professional conservationists like myself, to support those biologists and know what the right thing to do is, but they [biologists] don't have the ability to do anything about it." And as noted by one fishery manager, the health of the ecosystem has come into question.

The need to develop political will, across the spectrum of stakeholders, reflects the deficiencies of the ecosystem as a whole. The process of broad-based, meaningful engagement is undoubtedly laborious, but the outcome is one where stakeholders shape policy, rather than agency heads who may or may not be accountable for their decisions. It is ultimately the issue of accountability that will decide the effectiveness of an Ecosystem Approach to governance in the Greater Yellowstone Ecosystem, but the means of accomplishing this will require much in-depth study and undoubtedly an increase in conflict over natural resources in the ecosystem. The role of the Yellowstone cutthroat trout is simply an example or benchmark of where the ecosystem and its components (including humans) currently reside. If the ultimate goal is sustainability

much must be accomplished and it cannot begin without the development of political will, most of all from the communities found within the Greater Yellowstone Ecosystem.

Conclusion

Policy surrounding Yellowstone cutthroat trout, the native trout species of the Greater Yellowstone Ecosystem, consists of much more than simply managing the trout within select waterways. Historical policies and activities have greatly influenced the current disposition of the trout throughout its range. The contemporary threats to the YCT, some of which stem from historical activities, reflect stress on the subspecies from a multitude of drivers that span a number of human and ecological dimensions. The preceding chapter revealed a number of instances in which separate, discrete sectors, which on the surface do not appear connected to natural resource policy, influence Yellowstone cutthroat trout policy.

The advocacy coalition framework, its weaknesses already discussed within the chapter, offers a useful tool for examining policy surrounding Yellowstone cutthroat trout in the Greater Yellowstone Ecosystem. Two advocacy coalition within the policy subsystem have risen to attempt and implement their belief systems into policy, one coalition seeking listing of the trout under the Endangered Species Act, the other coalition maintaining that the current policy subsystem is more effective than a listing of the subspecies. The traditional approach to policy development has led dichotomous policy debate in that the debate is the result of attempting to solve the problems surrounding the trout through a reductionist model. While acknowledging the context that has produced the current debate between the two coalitions, the policy framework was also examined through the lens of the Ecosystem Approach.

The Ecosystem Approach maintains a number of criteria, each of which must be present in order to successfully achieve a sustainable policy paradigm. In the Greater Yellowstone Ecosystem there is a distinct lack of most of the criteria outlined throughout the chapter. The reasons for this lack of a holistic policy paradigm have been demonstrated within the chapter and point to the continued reductionist, traditional model of natural resource policy-making. The implications for the findings in this chapter are examined in chapter five in the context of the hypothesis statements on which this thesis is built.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS: YELLOWSTONE CUTTHROAT TROUT POLICY IN THE GREATER YELLOWSTONE ECOSYSTEM

Introduction

The following chapter will present a number of conclusions and recommendations related to the policy and management of Yellowstone cutthroat trout in the Greater Yellowstone Ecosystem. The discussion of each point will be based on the information and data provided and developed from the preceding chapters of this study. This may include information presented in the literature review related to specific topics, the two theories on which the study was based, the data presented within the case study itself, or any combination thereof. The conclusions and recommendations provided within this chapter are related solely to the policy and management of the Yellowstone cutthroat trout in the GYE and due to the limited scope of the study may be of limited generalization beyond. Nevertheless, it is the hope that each point may be useful in furthering the understanding of wildlife policy in the Greater Yellowstone Ecosystem for natural resource managers and researchers alike.

The chapter is organized by first discussing the hypotheses presented in chapter three and the extent to which the data from the case study in chapter four supports or refutes these hypotheses. The second section of the chapter will be dedicated to discussing recommendations related to the ecosystem approach to natural resource management criteria from chapter three and the extent to which the criteria has or has not been met with regards to the policy and management of YCT in the GYE and the

potential implications. The final section will provide brief concluding comments, drawing the study to a close.

Hypotheses Statement Results

H_1: Yellowstone cutthroat trout policy and management are conducted in accordance with the traditional reductionist model of natural resource policy-making in the Greater Yellowstone Ecosystem.

The literature review in chapter two demonstrated how natural resource policy and its implementation in the Mountain West is based on the scientific model which seeks to reduce problems to their smallest component, producing a reductionist approach to problem-solving. The chapter four presentation of the Yellowstone cutthroat trout case study highlights a natural resource policy apparatus that continues to perpetuate the traditional, reductionist problem-solving model. The policy process in the GYE is dominated by an expert systems structure that seeks little public involvement other than the submission of public comments at various times. The YCT policy process, like many others, continues to be substantially influenced by political borders, to the detriment of the subspecies. Crafting policy along static political boundaries continues to produce results that lack coordination between management entities that reflect environmental realities.

Cooperation among management agencies, as noted in the case study, is disparate at the best of times. Not even those involved in seeking to coordinate management can produce a general characterization of inter-agency coordination. Cooperation with non-management stakeholders becomes even more distant, and as noted above, public participation is largely non-existent except in pre-prescribed circumstances.

The expert driven policy system coupled with the continued adherence to political boundaries and the disparate inter-agency cooperation supports the hypothesis statement that the Yellowstone cutthroat trout policy process continues to be conducted in the traditional reductionist model.

H_2: Stakeholder involvement in the Yellowstone cutthroat trout policy subsystem does not reflect the broad-based stakeholder involvement requirement of the ecosystem approach.

The ecosystem approach criteria presented in chapter three noted the need for broad-based public and stakeholder support for the development and implementation of natural resource policy. Interviews with management officials and NGO representatives revealed an overwhelming, but not unanimous belief that the public, to include many stakeholders, were not involved meaningfully in the policy-making apparatus related to the Yellowstone cutthroat trout. There was an overwhelming belief by managers at both the federal and state levels that there was a lack of stakeholder participation in the development of YCT policy in the ecosystem. There was also a belief this lack of inclusiveness extended to the general public as well. Understanding that "the public" is an amorphous concept that will change not only overtime, but with regards to the particular question or conflict at hand, there was an acknowledgment that developing a robust public participation regime may be beyond the means of individual agencies. This is of course a well grounded conclusion when considering the limited funds and personnel within natural resource management agencies at any level. Nonetheless, there

was again an overwhelming concern and desire to increase public awareness and education with regards to YCT policy and management.

The question that arises from the desire to increase public awareness is in what manner will the public become involved in the decision-making process as informed concern increases? The desire by most interviewee's to see an increase in education efforts, if successful, will likely lead to an increased desire for a role in determining the policy actions with regards to the future of the native trout. The data acquired through the interview process reveals the need to increase grassroots stakeholder involvement in the realm of YCT policy in the Greater Yellowstone Ecosystem as well. The results of which provide support for the hypothesis statement that there is a lack of public involvement, which may begin to be remedied through the use of an increased public education and participation program.

H_3: The discovery of lake trout in Yellowstone Lake in 1994 was a disruption of the natural resources that comprise a portion of Yellowstone cutthroat trout policy subsystem, such that it influenced the policy core beliefs of the advocacy coalitions found within the subsystem.

The 1994 discovery of lake trout in Yellowstone Lake sent shudders throughout the fishery community of the Greater Yellowstone Ecosystem, but the direct implications were short of placing a direct influence on state fishery policies, initially. Each state fishery manager interviewed stated that the discovery of the lake trout, while most definitely imperative to the subspecies, did not produce direct effects on the policy of the

native trout within their state. Before we can consider this we must first consider the extent to which a policy subsystem had existed prior to the discovery of the lake trout.

The information and data in the preceding chapters demonstrates that each state in the GYE and the NPS, which has the authority to unilaterally manage YCT and their habitat, had an uncoordinated policy and management system in place. Each entity managed the subspecies in accordance to policies developed in line with the goals of each actor. This produced a disparate management system driven by policies that largely reflected economic goals, at least in the case of the states of Idaho, Montana, and Wyoming. The economic goal driven policies of the three states may have begun to shift towards conservation prior to 1994, but this study did not explore the quantitative or qualitative extent to which the policies changed prior to 1994. Instead, the policy system that was in place prior to 1994 was not a system that could be termed a policy subsystem in the sense that Sabatier and Jenkins-Smith recognize policy subsystems in the context of the advocacy coalition framework. This being the case, if there was no policy subsystem in 1994 then, logically, there could be no system-wide exogenous event to influence the non-existent policy subsystem.

Instead, it appears that 1994 discovery was the catalyst for the development of a new policy subsystem. Stakeholders were unhappy with the way in which the government (at multiple levels) were undertaking policy and management of the Yellowstone cutthroat trout and sought to change the system through the petition to list the species under the ESA in 1998.

The discovery of lake trout in 1994 appears to be the catalyst that evenually led to the petition to list the subspecies as threatened under the Endangered Species Act. The

petition to list the YCT appears much more as a system-wide event in that it led to the development of the Memorandum of Agreement in 2000 between the five states that contained Yellowstone cutthroat trout populations and the federal management agencies that managed either populations or YCT, habitat, or in the case of the NPS, both. With the lack of a preexisting policy subsystem in 1994 there cannot be a system-wide event to influence the policy core beliefs of advocacy coalitions that do not yet exist. Therefore there is no support to the hypothesis statement that the discovery of lake trout in Yellowstone Lake in 1994 was an event that influenced the policy beliefs of advocacy coalitions. Although, while in the view of the ACF the discovery of lake trout may not have produced direct policy implications within a policy subsystem, the discovery has impacted policy through the codification of YCT policy in the MoA, at the very least.

H_4: Technical data in the Yellowstone cutthroat trout policy subsystem has catalyzed learning across belief systems of opposing coalitions within the subsystem.

The use of technical data in the policy debate of the YCT has increased throughout the existence of the policy subsystem. The development of the range-wide status assessment and the use of sophisticated genetic analysis to determine the extent of hybridization are both examples of this. Under the ACF, technical data that is utilized in learning across belief systems does so through the "enlightenment function" that is produced through long-term exposure to conclusive data. This is coupled with the rise of an accepted standard of accuracy and reliability that is accepted by both sides of the debate. This does not appear to have taken place in this particular case.

Each side of the debate has relied on the range-wide status assessment to bolster their case, but there is lack of a recognized standard to arise from the work. If there had

been an accepted standard, it would logically have led to an analytical conclusion of the historic and current range of the native trout that was accepted by both side; this was obviously not the case as demonstrated through the enormous disparity in the resulting analysis by both coalitions. This is also the case in regards to establishing a genetic standard when considering what constitutes unacceptable levels of hybridization between a YCT and rainbow trout or another subspecies of cutthroat trout.

The debate over introgression, while highly technical, has revealed no set standard by which the data is applied. The lack of a standard has not only influenced the debate between the two advocacy coalitions, but has led to an intra-coalition debate between the Fish and Wildlife Service and the signatories of the 2000 position paper on cutthroat trout genetics. Both applications of technical data to the policy debate lack the necessary components that lead to a standardized understanding of the data which fosters learning across belief systems or the "enlightenment function". Therefore there is lack of support for the hypothesis statement that the use of technical data in the policy debate has led to learning across belief systems within the YCT policy subsystem.

H_{5a}: The advocacy coalition framework can be modified to extend beyond the use of elite belief systems in empirically determining the direction of policy in a subsystem to include grassroots stakeholders belief systems in natural resource policy subsystems.

The advocacy coalition framework is built upon the belief systems of policy elites. As natural resource policy-making has become more complex and has led to an increase in conflicts between stakeholders, there has been recognition of the need for a broad-based paradigm of natural resource management. As natural resource policy and

management begins to broaden and expand beyond policy elites to the realm of collaborative policy-making, there is a need for policy analysis frameworks and theories to continue providing a relevant means of exploring and understanding the policy process. In order for the advocacy coalition framework to continue to offer the type of policy analysis required to understand inclusive broad-based natural resource policy it will require a shift in its theoretical makeup.

The public involvement requirements of federal natural resource legislation provide a ready means of accounting for the belief systems of stakeholders beyond policy elites. This case study relied on the public comments provided in support of the twelve-month status review as a source of information related to the belief systems of non-elite stakeholders in the policy subsystems. The ability to aggregate non-elite stakeholders into advocacy coalitions using empirical data provided in public comments provides support for the hypothesis statement that the advocacy coalition framework may serve as a policy analysis tool beyond the typical elite belief systems approach.

H_{5b} The belief systems of grassroots stakeholders may be empirically identified through the use of public comments garnered through the public participation requirements of specific natural resource legislation.

Comments submitted in support of the twelve-month status review of the Yellowstone cutthroat trout offered an available source of information on the beliefs of non-elite stakeholders. The comments revealed the belief systems of industry related corporations, local watershed associations, and in at least one case, the belief system of a private citizen. Many of these are stakeholders in the policy subsystem typically fall outside the category of policy elites. Nevertheless, each has sought to influence the

development and implementation of Yellowstone cutthroat trout policy through the vector of an Endangered Species Act listing. In attempting to influence policy through the submission of public comments, each stakeholder could theoretically then be placed in an advocacy coalition within the policy subsystem. The public comments were referred to throughout the case study.

The case study supports the hypothesis statement that public comments may be utilized as a source for determining the belief systems of grassroots stakeholders. Although a word of caution is appropriate, this single case has a very small sample size from which to determine belief systems based on the use of public comments. Therefore before the usefulness of public comments as an empirical devise for policy analysis can be determined, more research must take place.

Recommendations

This section of the chapter will present a series of recommendations related to the policy and management of Yellowstone cutthroat trout. These recommendations are based on the results of this study, and to a great extent rely on the ecosystem approach to natural resource management.

Recommendation 1: Establish goals reflective of ecosystem-wide ecological processes and systems.

The 2000 Memorandum of Agreement set forth only a single goal for the conservation of Yellowstone cutthroat trout, to "ensure the persistence of the Yellowstone cutthroat trout subspecies within its historic range. Manage YCT to preserve genetic integrity and provide adequate numbers and populations to provide for

the protection and maintenance of intrinsic and recreational values associated with this fish."

When the document was used partially as the basis for rejecting the petition to list the YCT under ESA, a district court found the agreement lacking in substance such that the judge found the Fish and Wildlife Service had acted in an arbitrary and capricious manner (*Center for Biological Diversity, et al., v. Ralph Morgenweck, et al*). While lacking in its current form, the MoA contains the seeds for inter-agency cooperation, but continues to enforce the political boundaries that have thus far prohibited effective policy development.

Amending or creating a new MoA in a fashion that recognizes the need to manage YCT as part of a larger whole, may serve as the impetus in establishing ecosystem-wide goals for the management of Yellowstone cutthroat trout. Part of establishing ecosystem-wide goals must be the crafting of policy that removes the barriers to effective management put in place by political boundaries. The establishment of ecosystem-goals is a large undertaking in itself and must take place among a large number of stakeholders beyond simply the management agencies. An ecosystem-wide task force, sponsored by the Greater Yellowstone Coordinating Committee, may serve as an appropriate means to undertake this action. A second approach may be the establishment of an interstate compact that provides the legal authority for the commission to establish natural resoure policy throughout the ecosystem. While an interstate compact, such a commission would require that federal management agencies, key stakeholders, and the general public would have seats at the table. Based on a collaborative, consensus-based approach to policy, the inclusive nature of the

commission and the granted legal authority would provide the comission flexability and legitamacy. Such a commission might be established through a "Greater Yellowstone Ecosystem Compact".

Recommendation 2: Develop a legal mandate for integrated policy development.

An interim approach to overcoming the debilitating bureaucracy that perpetuates the traditional reductionist model of natural resource policy in the GYE is the streamlining of management agencies through vertical and horizontal integration. As noted in chapter two, conflict over natural resource policy often stems from inter-agency and state versus federal conflicts (Glick & Clark, 1998; Clark & Minta, 1994; and Clark, 1991). One means to implement an integrated approach is through legally mandated cooperation. Recognizing that many of the agencies involved are federal agencies, it is likely that the best means to accomplish this is to establish a regional integration effort based on the ecological boundaries of the ecosystem. A consensus approach to developing the legal mandate stands the best chance to weather political upheaval and resistance to the initiative while allowing all parties involved the greatest opportunity for meaningful engagement.

The goal of the legal mandate should not be to reinforce the top-down approach that has so effectively led to the current situation, but instead to begin transition to a collaborative approach to problem-solving. This will require the sharing of power between federal, tribal, and state agencies, not an easy undertaking in states that revere the federalist model.

Developing a legal mandate for the Yellowstone cutthroat trout subspecies, while seemingly reductionist in its intent, serves as a low conflict attempt at beginning to develop the institutional capacity for natural resource policy integration. Furthermore, such an attempt serves to support YCT conservation efforts.

Recommendation 3: Employ a consensus based YCT public participation plan.

A common theme throughout the interview process in this study revealed the desire for government decision-making bodies to include the public in the decision-making process. Developing an education program that focuses public awareness on the ecologically rational goals of an ecosystem-based policy process is only the first step in broad-based public involvement. In conjunction with a public education campaign is the need to involve the public in the decision-making process. Collaborative planning and decision-making analysis has revealed a number of cases and methods through which conflict over natural resource policy-making has either been avoided or reduced (Sabatier, et al, 2005; Lubell, 2004; Heikkila &Gerlak, 2005). While Yellowstone cutthroat trout policy-making is not as contentious as that of wolf management, when developing an ecosystem-wide policy regime the number of stakeholders, values, and conflicts will rise. Providing a meaningful method of public participation throughout the policy process will help to alleviate some of the more volatile and polarizing aspects of the debate through a consensus seeking process.

Recommendation 4: Identify conservation policy tools that augment those of the Endangered Species Act.

Acknowledgement by government officials and NGO representative alike that the Endangered Species Act lacks the historical precedent and nimbleness to serve as the overarching conservation policy tool for the Yellowstone cutthroat trout requires the search for and development of other tools for conservation of the subspecies. The Candidate Conservation Agreement with Assurances appears to be a viable option for a publicly involved conservation policy tool. But it will take more than simply the CCAA to develop and implement an ecosystem-wide, ecologically rational conservation strategy for the Yellowstone cutthroat trout. Producing new and innovative conservation tools will require the input and involvement of the public which is in close proximity to the native trout and its habitat. Fishery and NGO experts do not hold a monopoly on the expertise related to the fish and its habitat, both should seek the ingenuity of the grassroots public in developing new conservation tools. At the same time, if the YCT becomes listed under the Endangered Species Act, the track record of the Act in recovering fish species is not a good one, therefore in the event of a listing there is still a need for innovation in recovering the subspecies to the point where it may be removed from the list.

An innovative way to institute public involvement while providing education on the situation may begin with instituting local problem-solving institutions beyond the typical economically driven conservation districts. Finding alternatives to the ESA, which has become demonized in the Mountain West, can produce win-win situations for

YCT conservation and curtail or remove the need for an ESA listing and the litigation that follows.

Recommendation 5: Increase research and development efforts in support of policy goals.

Noted throughout this work has been (1) the ineffectiveness of status quo traditional policy and management techniques and (2) the inadequacy of the ESA to provide the type of recovery effort needed for the Yellowstone cutthroat trout. The combination of both factors has led to the need for bold and innovative efforts, not just in policy-making, but research and development in species conservation. The lake trout crisis and the need to mitigate and restore fragmented habitat both require innovative tools and methods that are currently undeveloped or unavailable to managers in the GYE. Understandably, such a call harks back to the need of every agency for funding and personnel, overcoming these traditional hurdles will require dedicated stakeholders, grassroots and elite, and the development of political will.

A logical place to begin these efforts are with the funding and collecting of monitoring data. The development of baseline monitoring data, for broad spectrum analysis, beyond simply the numbers of fish in a lake or stream, can serve as the first step in a comprehensive R&D plan that has been developed with public input and established in line with end state goals of the ecosystem plan. Such a proposal will be years in the making, but may begin with something as small as a planning committee that develops the ideas to take to the public and remaining stakeholders.

Recommendation 6: Establish empirical thresholds for the listing of species under the Endangered Species Act.

Agency officials and NGO representatives alike express deep concerns over the subjective nature of the Endangered Species Act and its application. While the Act does require the use of the best available scientific and commercial data, the analysis and application of this data can be and has been widely disparate, leading to increased conflicts and litigation over the protection of species, as noted by the debate of historical range between the two main sources Behnke (1992) and May (2003). Both agency and NGO officials have noted the need for the development of a process that requires the use of empirical evidence in support of listing, and ultimately managing and delisting, a species under the ESA. Formal rulemaking may allow the Fish and Wildlife Service to implement such tool without the need for an amendment to the Act itself. While such a move is likely to be contentious, as all things involving ESA are, such an effort possesses the ability to remedy more issues and conflict than it creates and more importantly, it serves the recovery efforts for targeted species while preserving the nature and intent of the Act.

Conclusion

The purpose of this study was to analyze policy surrounding the Yellowstone cutthroat trout, in particular the tools used by stakeholders and the extent to which current efforts reflect an ecosystem approach. Throughout the course of this study the reader has been introduced to numerous aspects of wildlife policy that, at first glance, do not appear to affect something as mundane as Yellowstone cutthroat trout policy. The conflicts that

arise out of the policy and management decisions of the YCT are reflective of many of the conflicts related to wildlife management not only in the Greater Yellowstone Ecosystem, but the Mountain West, albeit at a much lower level of conflict than say that of grazing rights or gray wolf management. Even more so, the issues, concerns, and conflicts surrounding YCT policy and management are reflective of the debates involving other inland cutthroat trout subspecies. The conflicts discussed in the literature review and contextual mapping chapter may not be as obvious or as poisonous as with other species, so the lower level of conflict may foster the ability to undertake a new form of policy and management in the GYE.

An ecosystem approach to natural resource policy is arduous and cumbersome with results being measured in years and decades. Nonetheless, the holistic efforts of an ecosystem approach provides stakeholders at all levels of involvement a win-win situation through a variety of mechanisms. These mechanisms and devices will not be established without trial and error and many times, failure. Uncertainty will inevitably be a continuing challenge of such an undertaking, but the alternatives are simply to dire to allow the status quo to be maintained.

In the GYE, as is many times the case with rural communities, continued economic livelihood is at the center of decisions relating to natural resources, decisions that are often driven by deeply held beliefs and spurred by emotions. The belief that in order to survive rural communities must continue to rely on resource extractions as the dominant means of economic livelihood is a fallacy that must be dispelled. But it must be done in a manner that accounts for and understands the culture and traditions that have given these rural communities there meaning and existence. The human dimension of the

ecosystem cannot and should not be sacrificed, rather the rural communities must be engaged in a manner that facilitates an understanding and desire for change.

The current economic and demographic changes that are reshaping the communities of the GYE will undoubtedly have profound consequences for decision relating to natural resource management in the ecosystem. But such changes do not necessarily have to be negative. The natural amenities that the region offers may be the greatest tool for success in realigning perceptions and goals in the GYE. If economic issues continue to be the main driver behind natural resource, and to a lesser extent wildlife, policy then the opportunities to harness the economic revitalization coupled with conservation are in place. For as noted Yellowstone historian Paul Schullery offered during an interview, it is the authenticity of the region and its elements that may be one of the greatest treasures of the GYE. Maintaining the authentic character of the Greater Yellowstone as it is encapsulated in its open spaces, wilderness, and flourishing and abundant wildlife requires the conservation of these elements. Finally, it may well be these characteristics which drives future economic survival while maintaining the rugged individualism, history, and culture that is found in the Greater Yellowstone Ecosystem.

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APPENDICES

APPENDIX A

LIST OF INTERVIEWEES

Name (listed alphabetically), institutional affiliation, and interview location.

Scott Barndt, Forest Fish Biologist, Gallatin National Forest, U.S. Forest Service, Newmarket New Hampshire (phone interview).

Scott Bosse, Rivers Conservation Coordinator of the Greater Yellowstone Coalition, Bozeman, Montana.

Jim Darling, South-central Regional Fisheries Manager, Montana Fish, Wildlife & Parks, Billings, Montana.

Bruce Farling, Executive Director, Montana Trout Unlimited, Newmarket, New Hampshire (phone interview).

Scott Grunder, Native Species Coordinator, Fisheries Bureau, Idaho Department of Fish and Game, Newmarket, New Hampshire (phone interview).

Lynn Kaeding, Chief, Branch of Native Fishes Management, Montana Fish & Wildlife Management Assistance Office, U.S. Fish & Wildlife Service, Bozeman, MT.

Todd Koel, Fisheries Supervisor, Yellowstone National Park, National Park Service, Yellowstone National Park, Wyoming.

Ken McDonald, Fisheries Management Bureau Chief, Montana Fish, Wildlife & Parks, Helena, Montana.

Paul Schullery, Writer Editor, Yellowstone National Park Center for Resources, National Park Service, Bozeman, Montana.

Steve Yekel, Regional Fisheries Supervisor, Cody Region, Wyoming Game and Fish Department, Cody, Wyoming.

APPENDIX B

INSTITUTIONAL REVIEW BOARD APPROVAL

UNIVERSITY of NEW HAMPSHIRE

May 4, 2006

Brad Johnson
Political Science, Horton SSC
8 Bennett Way, #27
Newmarket, NH 03857

IRB #: 3714
Study: Policy Learning in the Greater Yellowstone Ecosystem: Conservation Policy and the Yellowstone Cutthroat Trout A Case Study
Approval Date: 05/01/2006

The Institutional Review Board for the Protection of Human Subjects in Research (IRB) has reviewed and approved the protocol for your study as Exempt as described in Title 45, Code of Federal Regulations (CFR), Part 46, Subsection 101(b). Approval is granted to conduct your study as described in your protocol.

Researchers who conduct studies involving human subjects have responsibilities as outlined in the attached document, *Responsibilities of Directors of Research Studies Involving Human Subjects.* (This document is also available at http://www.unh.edu/osr/compliance/irb.html.) Please read this document carefully before commencing your work involving human subjects.

Upon completion of your study, please complete the enclosed pink Exempt Study Final Report form and return it to this office along with a report of your findings.

If you have questions or concerns about your study or this approval, please feel free to contact me at 603-862-2003 or Julie.simpson@unh.edu. Please refer to the IRB # above in all correspondence related to this study. The IRB wishes you success with your research.

For the IRB,

Julie F. Simpson
Manager

cc: File
Stacy VanDeever

Research Conduct and Compliance Services, Office of Sponsored Research, Service Building, 51 College Road, Durham, NH 03824-3585 * Fax: 603-862-3564

APPENDIX C

YELLOWSTONE CUTTHROAT TROUT PREDATOR SPECIES

Table 1. Checklist of birds and mammals known or suspected to utilize Yellowstone cutthroat trout as a food source in the Yellowstone Lake drainage.

Species		Known	Suspected
Mammals:			
Water shrew	*Sorex palustris*	X	
Masked shrew	*Sorex cinereus*		X
Dusky shrew	*Sorex monticolus*		X
Deer mouse	*Perimyscus maniculatus*	X	
Red squirrel	*Tamiasciurus hudsonicus*	X	
Uinta chipmunk	*Tamias umbrinus*		X
Flying squirrel	*Glaucomys sabrinus*		X
Muskrat	*Ondatra zibethicus*		X
Ermine	*Mustela erminea*	X	
Longtailed weasel	*Mustela frenata*	X	
Mink	*Mustela vison*	X	
Marten	*Martes americana*	X	
Striped skunk	*Mephitis mephitis*		X
Otter	*Lutra canadensis*	X	
Wolverine	*Gulo gulo*		X
Badger	*Taxidea taxus*		X
Coyote	*Canis latrans*	X	
Bobcat	*Lynx rufus*	X	
Cougar	*Felis concolor*	X	
Black bear	*Ursus americanus*	X	
Grizzly Bear	*Ursus horribilus*	X	
Raccoon	*Procyon* sp.		X
Birds:			
White pelican	*Pelecanus occidentalis*	X	
Common merganser	*Mergus merganser*	X	
Blue heron	*Ardea herodias*	X	
California gull	*Larus californicus*	X	
Eared grebe	*Podiceps caspicus*		X
Loon	*Gavia immer*	X	
Caspian tern	*Hydroprogne caspia*	X	
Barrows goldeneye	*Bucephala islandica*		X
Bufflehead	*Bucephala albeola*		X
Dble. crest. cormorant	*Phalacrocorax auritus*	X	
Western grebe	*Aechmophorus occidentalis*	X	
Redtailed hawk	*Buteo jamaicensus*		X
Bald eagle	*Haliaeetus leucocephalus*	X	
Osprey	*Pandion haliaetus*	X	
Belted kingfisher	*Megaceryle alcyon*	X	
Dipper	*Cinclus mexicanus*	X	
Gray Jay	*Perisoreus canadensis*	X	
Stellers jay	*Cyanocitta stellari*	X	
Crow	*Corvus brachyrhynchos*		X
Raven	*Corvus corax*	X	

Source: Varley, J.D. & Schullery, P. (Eds.). (1995). *The Yellowstone Lake Crisis: Confronting a Lake Trout Invasion.* Yellowstone Center for Resources: Yellowstone National Park, Wyoming, p 13.

APPENDIX D

MEMORANDUM OF AGREEMENT

MEMORANDUM OF AGREEMENT

FOR

CONSERVATION AND MANAGEMENT

OF

YELLOWSTONE CUTTHROAT TROUT
(*Oncorhynchus clarki bouvieri*)

AMONG

MONTANA
IDAHO
WYOMING
NEVADA
UTAH
U.S. FOREST SERVICE
YELLOWSTONE NATIONAL PARK
GRAND TETON NATIONAL PARK

May 2000

MEMORANDUM OF AGREEMENT

This Memorandum of Agreement (MOA) has been developed to define shared goals and objectives for the conservation and restoration of Yellowstone cutthroat trout within its historic range. In addition to defining shared goals for conservation of Yellowstone cutthroat trout (YCT), this MOA also outlines a process of cooperation, coordination, and data sharing among the resource agencies with management responsibility for YCT.

Implementation of the MOA will enhance coordinated conservation efforts among and between resource agencies (Agencies) on behalf of Yellowstone cutthroat trout, and should result in a greater understanding of the overall status and distribution of the subspecies throughout its range. Threats to YCT that warrant its status as a species of special concern by state and federal resource management agencies will be reduced or eliminated through implementation of this MOA.

Separate Memoranda of Understanding and Conservation Agreements will be developed with other resource management agencies and additional, supporting entities as necessary to ensure implementation of specific conservation measures. In addition, interested government agencies and conservation groups will be given opportunity to review and provide input on specific actions.

INVOLVED PARTIES (Agencies)

Montana Department of Fish, Wildlife and Parks
1420 East Sixth Avenue
Helena, MT 59602

Idaho Department of Fish and Game
600 South Walnut, Box 25
Boise, ID 83707

Wyoming Game and Fish Department
5400 Bishop Boulevard
Cheyenne, WY 82006

Nevada Division of Wildlife
1100 Valley Road
Reno, NV 89512

Utah Division of Wildlife Resources
1594 West North Temple
Salt Lake City, UT 84114

Yellowstone National Park
P.O. Box 168
Yellowstone NP, WY 82190

U.S. Forest Service
Regions 1, 2, 4
c/o 200 East Broadway
Missoula, MT 59807

Grand Teton National Park
P.O. Box 170
Moose, WY 83012

DISTRIBUTION

YCT historically occurred in the Snake River drainage from the headwaters down to Shoshone Falls in the Columbia River basin, including the fine-spotted cutthroat, and in the Yellowstone drainage from the headwaters down to at least the confluence of the Big Horn River near Billings, Montana. This distribution includes large areas within Montana, Idaho, and Wyoming, including Yellowstone National Park, as well as the northeastern corner of Nevada and northwestern corner of Utah.

The exact distribution of historically occupied streams is unknown, but it is believed that most streams in the upper Snake and Yellowstone drainages were occupied by YCT. Information on current status indicates that populations have declined from historic levels largely due to historic habitat changes and influences from non-native fish species that were stocked throughout both basins. The genetic status/purity of remaining YCT populations remains largely unknown. However, the percentage of YCT streams occupied by genetically pure YCT is substantially less than the total due to introgression from rainbow trout and westslope cutthroat trout stocked in historic YCT drainages over many decades. Other causes of YCT decline and existing threats include loss of habitat, habitat degradation, whirling disease, potentially New Zealand mud snails, and non-native fish species (e.g., lake trout) that compete with or prey on YCT. Because of the decline in distribution, and threats to existing intact populations, the Agencies have classified YCT a species of concern, and have been taking management and conservation steps to reduce threats and ensure the long-term persistence within its native range.

For the purposes of this MOA, YCT outside of their historical, native range are not considered as conservation populations.

AGREEMENT

Pursuant to this MOA, the Agencies agree to the following:

Goals and Objectives: The Agencies agree to the following goals and objectives, will continually strive to accomplish them, and agree to incorporate them into their respective planning and budgeting processes.

Goal: Ensure the persistence of the Yellowstone cutthroat trout subspecies within its historic range. Manage YCT to preserve genetic integrity and provide adequate numbers and populations to provide for protection and maintenance of intrinsic and recreational values associated with this fish.

Objective 1. Identify all existing populations

Identify all YCT populations within the historical native range of YCT and maintain database of the the most current distribution.

Objective 2. Secure and enhance conservation populations

Identify genetic purity of existing populations. Prioritize populations based on genetic purity, population size, unique characteristics, and management goals. Secure and if necessary enhance all known and suspected genetically pure YCT populations, and high priority introgressed populations. These efforts might include, but are not limited to:

- Isolation of populations to prevent or mitigate invasion by hybridizing and/or competing non-native fish.
- Habitat restoration
- Modification of land uses to provide for YCT habitat and population protection.
- Expansion of current populations within the context of their streams and watersheds.
- Suppression or eradication of non-native fish species that are adversely affecting native YCT
- Prevention of non-native fish stocking in drainages or portions of drainages that support pure Yellowstone cutthroat where such stocking may negatively impact a pure Yellowstone cutthroat trout population or restoration potential.
- Adjust harvest regulations where angler harvest is altering population age/size structure and affecting recruitment.

Objective 3. Restore populations

Increase the number of stream populations by restoring YCT within their native range. Local restoration goals and approaches will be developed to meet this objective.

Objective 4. Public Outreach

Develop and implement a public outreach effort specifically addressing YCT conservation. Public outreach efforts will utilize the many and varied options available to get the native trout story to the public.

Objective 5. Data Sharing

The Agencies agree to summarize existing distribution, genetics, and conservation accomplishments data in a manner that allows data summaries and comparisons between and among jurisdictions.

Objective 6. Coordination

The Agencies will meet at least once annually to review accomplishments towards conservation of YCT, to share information, to identify, discuss, and solve common problems related to conservation of YCT, and to prioritize common issues that should be addressed under the purview of this MOA. Meeting minutes and assignments will be mailed to all Agency representatives and interested parties shortly following the meeting. This MOA will be reviewed and modified as necessary at the annual coordination meeting.

Objective 7. Implementation

The Agencies will work towards meeting the above goals and objectives through independent activities and work programs, as well as by communicating successes and pitfalls with one another, sharing information, and working cooperatively to solve common problems and threats.

AUTHORITY

This MOA is intended to facilitate coordination and cooperation between the Agencies for conservation of YCT. All parties to this MOA recognize that they each have specific statutory responsibilities that cannot be delegated, particularly with respect to the management and conservation of wildlife, its habitat, and the management, development, and allocation of water resources. Nothing in this MOA is intended to abrogate any of the parties' respective responsibilities.

This MOA is subject to and is intended to be consistent with all applicable Federal and State laws and interstate compacts.

This MOA in no way restricts the parties involved from participating in similar activities with other public or private agencies, organizations, or individuals.

The State of Wyoming and the Commission do not waive sovereign immunity by entering into this MOA, and specifically retain immunity and all defenses available to them as sovereigns pursuant to Wyoming Statute 1-39-104(a) and all other state law.

Modifications within the scope of this MOA shall be made by the issuance of a bilaterally executed modification prior to any changes being performed.

Nothing in this Agreement shall obligate any cooperator to expend appropriations or to enter into any contract or other obligation. This is neither a fiscal nor a funds obligation document. Any endeavor involving reimbursement or contribution of funds between the parties to this agreement will be handled in accordance with applicable laws, regulations, and procedures including those for Government procurement and printing. Such endeavors will be outlined in separate

agreements that shall be made in writing and shall be independently authorized by appropriate statutory authority.

SIGNATURES

Patrick Graham, Director
Montana Department of Fish, Wildlife & Parks

Rodney Sando Director
Idaho Department Fish and Game

John Baughman, Director
Wyoming Game and Fish Department

John Kimball, Director
Utah Division of Wildlife Resources

Terry R. Crawforth, Administrator
Nevada Division of Wildlife

Michael V. Finley, Superintendent
Yellowstone National Park

Dale Bosworth, Regional Forester
U.S. Forest Service
For Regions 1, 2 and 4

Jack Neckels, Superintendent
Grand Teton National Park

APPENDIX E

COMPLETE LIST OF PUBLIC COMMENT SUBMISSIONS, TWELVE-MONTH STATUS REVIEW OF THE YELLOWSTONE CUTTHROAT TROUT

1. Henry's Lake Foundation
2. Park Conservation District
3. Peggy H. McLeod
4. U.S. Bureau of Reclamation
5. J.R. Simplot Company
6. U.S. Forest Service
7. Idaho Fish and Game
8. Montana Fish, Wildlife & Parks
9. Wyoming Game and Fish
10. Yellowstone National Park
11. Center for Biological Diversity
12. Southern Crazy Mountain Watershed Group
13. Michael Banach
14. Friends of the Teton River
15. Northwest Environmental Defense Center
16. Greater Yellowstone Coalition
17. Idaho Mining Association
18. Upper Shields Watershed Association
19. The Shoshone-Bannock Tribes of the Fort Hall Indian Reservation

APPENDIX F

SAMPLE PUBLIC COMMENTS

United States Department of the Interior

NATIONAL PARK SERVICE
P.O. Box 168
Yellowstone National Park
Wyoming 82190

N1423(YELL)

ELECTRONIC COPY – HARD COPY TO FOLLOW

October 26, 2005

Mr. Wade Fredenberg
U.S. Fish and Wildlife Service
780 Creston Hatchery Road
Kalispell, Montana 59901-8239

Re: Yellowstone Cutthroat Comments

Dear Mr. Fredenberg:

I am writing in response to the news release dated September 1, 2005, regarding the initiation of a status review of Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*) to determine whether or not to propose listing the species as threatened or endangered under the Endangered Species Act. Conservation of Yellowstone cutthroat trout is a high priority for the National Park Service, and we greatly appreciate the opportunity to provide the comments for you to consider below.

Background

The largest inland cutthroat trout population remaining in the world is the adfluvial Yellowstone cutthroat trout population of Yellowstone Lake. Shortly after the establishment of Yellowstone National Park as the world's first national park in 1872, the fishery was widely publicized in national and local newspapers, as well as periodicals such as *Forest and Stream* and *American Angler*. Anglers began visiting the lake, its tributary streams, and the Yellowstone River in great numbers, and the U.S. Fish Commission began looking for ways to propagate and distribute the cutthroat trout of Yellowstone Lake to locations across North America. The result was the development of a federally-operated fish culture facility on the north shore of Yellowstone Lake. From 1900 to 1956, over 818 million cutthroat trout eggs were removed for use in other waters, mostly outside Yellowstone National Park. The cutthroat trout also were subject to a great amount of angling pressure, and were commercially fished to provide food for visitors until 1919, just after the creation of the National Park Service. Evidence of a cutthroat trout population decline during the mid-1900s resulted in the closure of the egg-taking operations and implementation of increasingly restrictive angling regulations. These actions resulted in a tremendous increase in the numbers of Yellowstone cutthroat trout within Yellowstone Lake and its tributary spawning streams.

Currently, in streams of Yellowstone National Park, Yellowstone cutthroat trout populations in some cases have been compromised by introgression with introduced, nonnative rainbow trout (*O. mykiss*) or competition with other, introduced nonnative trout species. Fortunately, the large cutthroat trout population of Yellowstone Lake and its associated drainage have remained genetically pure due to isolation provided by the Lower and Upper Falls of the Yellowstone River, located 25 km downstream from the lake outlet near Canyon. The genetic purity of these fish make them extremely valuable; however, the population has recently been exposed to three other potential stressors, including introduced nonnative lake trout, invasion by the exotic parasite *Myxobolus cerebralis* (the cause of whirling disease), and the drought that has persisted in recent years throughout the Intermountain West.

Lake Population Status

Contemporary data suggest that a decline has recently occurred in the Yellowstone Lake cutthroat trout population. The number of upstream-migrating cutthroat trout counted at Clear Creek, a major spawning stream, was only 1,438 during 2004. This count was down from 3,432 in 2003, and 6,613 in 2002, and was the lowest count made at Clear Creek since 1945, the first year total annual counts were recorded there. The fish counting station operated on Bridge Creek, a small northwestern spawning tributary, indicated that only a single fish migrated upstream during 2004. The number of spawning cutthroat trout in recent years has declined by more than 50 percent annually in Bridge Creek, and has decreased by over 99 percent since

1

counts began in 1999 (when 2,363 cutthroat trout ascended the stream to spawn). The decline was also evident in results of the fall netting assessment, where an average of 15.9 cutthroat trout were caught per net in 1994, and only 6.1 were caught per net in 2002. During 2003–2004, however, the fall netting assessment provided some of the first indications that the cutthroat trout population may be rebounding due to the conservation efforts we currently have in place (see below). An average of 7.4 fish were caught per net in 2003, and 7.9 fish were caught per net in 2004. Prior to 2003, the reduction in catch by the fall netting program had been 0–21 percent each year (averaging 11 percent per year) since 1994, the year lake trout were first discovered in Yellowstone Lake.

Actions in Place to Preserve the Lake Population

Since the discovery of lake trout in Yellowstone Lake in 1994, efforts to counteract this nonnative species have intensified. The NPS gillnetting program has removed >136,000 lake trout since 1994. The gillnetting effort has increased in recent years to an average of ten times that of 1999. Catch rate has declined since 1998, when an average of 5.5 lake trout per unit of effort was caught (CPUE). In 2004, CPUE for lake trout remained low (1.69) but was slightly higher than that of 2001–2003.

As the lake trout population has grown and expanded in recent years, spawning fish have become a focal point for the removal program. In 2003, an additional lake trout spawning location was identified near the West Thumb Geyser Basin. This area, along with areas near Carrington Island, Solution Creek, and Breeze Channel, has been gillnetted since 1996. The total number of spawning lake trout caught by gillnetting was 2,371 in 2003 and 7,283 fish in 2004. An additional 1,063 spawning lake trout were removed by electrofishing in 2004. The average length of spawning lake trout removed near spawning areas has decreased each year. The recent decline in the annual lakewide catch rate of lake trout and the annual reduction in the average length of sexually mature fish are positive indications that the removal program is exerting measureable mortality on this population.

The NPS will continue to investigate new methods to target the lake trout population. In particular, using hydroacoustics, underwater cameras, and high resolution (1 m) bathymetry, NPS is currently delineating and characterizing known lake trout spawning areas (all presently in the West Thumb), to predict where new spawning areas may be pioneered in the lake basin. These potential spawning areas will be closely monitored and targeted for lake trout removal if fish begin to use them in the future. Close collaboration with partner agencies and universities is resulting in the best science available for use in targeting and suppressing the nonnative lake trout population, and save remaining Yellowstone cutthroat trout of the lake system.

Stream Population Status

Of the approximately 3132 km of stream originally supporting resident (fluvial) Yellowstone cutthroat trout (mostly outside of the Yellowstone Lake and river drainage above the Lower and Upper Falls), 65 percent (2025 km) continue to support genetically pure fish, and 35 percent (1107 km) now are home to fish compromised by hybridization with nonnative rainbow trout. We do not know of any Yellowstone cutthroat trout fluvial population within Yellowstone where the species has been completely extirpated due to historical nonnative fish introductions or other factors. In fact, there are many locations within the park where these populations appear to be relatively secure. These areas include the upper Lamar River drainage and the upper Snake River drainage, as examples.

Actions in Place to Restore Stream Populations

With a great amount of generous support from the Yellowstone Park Foundation Fisheries Initiative, park fisheries staff are now positioned to conduct intensive field investigations and fisheries surveys to identify the best locations for the reintroduction of native Yellowstone cutthroat trout to watersheds within the Northern Range. The ultimate goal of this work will be to return self-sustaining populations of genetically pure cutthroat trout to headwater enclaves. It is expected that the Fisheries Initiative will lead to a substantial increase in the geographic distribution and overall population viability of native, genetically pure cutthroat trout. The Fisheries Initiative will also greatly help to ensure that the ability to fish for these precious species is maintained for all future generations of visitors to Yellowstone National Park.

To best ensure that the native Yellowstone cutthroat trout populations within the park continue to persist into the foreseeable future, even with a high degree of angling pressure, in 2001 we instituted a mandatory catch-and-release regulation for the cutthroat trout and all other native park fish species. In addition, this past year we presented a proposal to the public for liberalizing harvest limits for nonnative species that exist in waters that are also inhabited by our native cutthroat trout. The proposal also included the potential of requiring the use of barbless hooks when angling in the park. Initial analyses of over 500 comments from the public indicated that there is overwhelming support for both of the proposed changes. Implementing these proposed changes will result in reduced stress on Yellowstone cutthroat trout, through a potential reduction in harmful nonnative fish species, and reduced handling time and injury by anglers in the park as will occur with the use of barbless hooks.

Summary

Since lake trout in Yellowstone Lake are known to prey on the native cutthroat trout, the removal of >136,000 lake trout has reduced predation on this important population. Anglers have also supported and greatly contributed to the lake trout removal program. At present, a mandatory kill regulation is in place for all lake trout caught on Yellowstone Lake, and the NPS asks anglers each year to assist with the lake trout removal effort in this way. Yellowstone also gains an incredible amount of public support each year for native cutthroat trout conservation efforts through the Yellowstone Volunteer Fly Fishing Program, where anglers assist with fisheries surveys and restoration activities throughout the park.

The cumulative effects of lake trout and whirling disease have put stress on the Yellowstone Lake cutthroat trout population during a period of intense drought in the Intermountain West. The prospects of lake trout control and rehabilitating historical cutthroat trout abundance are yet to be achieved. However, the relatively low CPUE and an annual decrease in the size of sexually mature lake trout are indicators that the removal program is exerting significant pressure on this lake trout population. A continued focus on lake trout removal will be continued into the future so cutthroat trout can persist in Yellowstone Lake at a level allowing the overall integrity of the Greater Yellowstone Ecosystem to be maintained. Our recent, peer-reviewed manuscript based on the Yellowstone cutthroat trout population and the lake trout removal program on Yellowstone Lake, appearing in the November issue of the American Fisheries Society journal *Fisheries*, is enclosed for your reference.

Nearly 100 percent of the Yellowstone fisheries annual budget is now directed at the preservation of remaining Yellowstone Lake cutthroat populations, especially the Yellowstone Lake cutthroat of Yellowstone Lake, but also, due to generous private donor support, the future restoration of Yellowstone Lake cutthroat stream resident populations in the park's Northern Range. Please consider our many, significant conservation actions to preserve and restore the native Yellowstone cutthroat trout in your current status review of this subspecies.

Suzanne Lewis
Superintendent

Enclosure

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October 31, 2005

Mr. Wade Fredenberg
Yellowstone Cutthroat Trout Comments
U.S. Fish and Wildlife Service
780 Creston Hatchery Road
Kalispell, Montana 59901-8239

Dear Mr. Fredenberg:

On behalf of the Greater Yellowstone Coalition, please accept the following comments regarding the ongoing status review of Yellowstone cutthroat trout. The Greater Yellowstone Coalition (GYC) is a non-profit conservation organization of nearly 13,000 members from across the nation working to protect the lands, waters and wildlife of the Greater Yellowstone Ecosystem.

GYC has a long history of working to protect and restore Yellowstone cutthroat trout (YCT). In 2001, we successfully lobbied Congress to provide long-term funding to the National Park Service so it could continue its lake trout control program in Yellowstone Lake. This year, we helped secure $1.8 million in transportation funding to open up fish passage to YCT in two key spawning tributaries to Henry's Lake. Most recently, we sponsored a Yellowstone cutthroat trout symposium in Idaho Falls that was attended by more than 100 biologists, land managers and other interested citizens from across Idaho, Montana and Wyoming. Our comments focus on some of the new information that emerged from that symposium.

While the overall picture that was painted at the symposium showed YCT holding steady in terms of geographic distribution compared to when they were first petitioned for listing under the Endangered Species Act in 1998, we are deeply concerned about the recent sharp declines in abundance of YCT in two of their historic strongholds – Yellowstone Lake and the Teton River system. We are also concerned about the serious and ongoing threat posed by non-native rainbow trout in the South Fork Snake River system below Palisades Dam.

Crisis in Yellowstone Lake

According to Yellowstone National Park biologists, YCT numbers in several of Yellowstone Lake's most important spawning tributaries have declined by more than 95 percent over the past few years. In Pelican Creek, the annual spawning run of YCT plummeted from over 15,000 fish in the mid-1980s to zero fish today. In Bridge Creek, the YCT spawning run has declined from approximately 2,500 fish in the late 1990s to fewer than 100 fish today. And perhaps of greatest concern, the spawning run of YCT in Clear Creek – historically the most important spawning tributary to Yellowstone Lake – has declined from more than 60,000 fish in the late 1980s to fewer than 1,000 fish this year. Not surprisingly, the sharp decline in YCT

spawning numbers in tributary streams has manifested itself in sharply reduced numbers of adult YCT in Yellowstone Lake. The Park Service's annual fall gillnetting survey of YCT in Yellowstone Lake shows a steep decline in adult YCT numbers beginning in the mid 1990s. This precipitous decline has been attributed to three factors – heavy predation by lake trout, whirling disease and the ongoing severe drought. While little can be done about the drought and whirling disease outbreak, we are concerned that not enough is being done to confront the lake trout invasion.

Drought and Non-Native Fish Taking a Toll in the Teton River

While YCT generally appear to be holding steady – albeit at drastically reduced numbers compared to historic levels – in many rivers throughout their current range, one river where they have recently suffered dramatic declines is the Teton drainage in eastern Idaho. Surveys conducted by the Idaho Department of Fish and Game and Friends of the Teton River show YCT have declined by more than 95 percent in several key spawning tributaries over the past five years. These sharp declines have been attributed to the ongoing drought and subsequent dewatering of key spawning tributaries, whirling disease, and negative interactions with rapidly expanding populations of non-native rainbow and brook trout.

Rainbow Trout in the South Fork Snake

While YCT have declined less sharply in the South Fork Snake River compared to Yellowstone Lake or the Teton River, recent surveys reveal a major new threat emerging in the form of hybridization and competition with non-native rainbow trout. According to data collected by the Idaho Department of Fish and Game, adult rainbow trout were virtually non-existent in the South Fork prior to 1990. By 2003, there were as many adult rainbow trout per mile as YCT. In response to this trend, IDFG has launched a three-pronged offensive against rainbow trout that includes reshaping flows out of Palisades Dam to benefit YCT, installing weirs across the mouths of spawning tributaries to prevent rainbow trout from hybridizing with YCT, and aggressively encouraging anglers to harvest rainbow trout. While preliminary data shows these strategies appear to be yielding positive results, it is still much too early to say whether the threat posed by rainbow trout has been effectively stemmed.

The Good News: YCT Remain Healthy in the Snake Headwaters

The one bit of good news to come out of the Yellowstone cutthroat trout symposium is the continued healthy status of YCT in the headwaters of the Snake River system upstream from Palisades Reservoir. According to biologists from the Wyoming Game and Fish Department and Bridger-Teton National Forest, YCT continue to do well here for three reasons. First, the watershed has only one major dam (Jackson Lake Dam), so the natural hydrograph is still largely unaltered. Second, relatively few non-native fish introductions have occurred here. And third, YCT in the Snake headwaters co-evolved with several other fish species, a factor which may allow them to compete better with introduced fish species. Because of these factors, the finespotted Snake River cutthroat trout is the only native cutthroat trout subspecies in the Interior West that continues to dominate its native range.

Endangered Species Act Implications

While GYC has not yet taken a position on whether Yellowstone cutthroat trout should be listed as a "threatened" species under the federal Endangered Species Act, we believe two facts to be irrefutable. First, YCT have declined sharply across their historic range both in terms of abundance and distribution over the past century, and these declines continue in many places today. Second, some aquatic habitats that only five years ago were considered to be YCT strongholds – especially Yellowstone Lake and the Teton River – are now experiencing some of the most alarming declines in YCT numbers. Even if genetically introgressed Yellowstone cutthroat trout populations are factored in, YCT still have disappeared from more than 90 percent of their historic range. From a purely biological standpoint, the case for an ESA listing is very compelling.

As the U.S. Fish and Wildlife Service proceeds with its status review to determine whether YCT should be listed for protection under the ESA, we trust it will factor in all the new information from Yellowstone Lake, the Teton and South Fork Snake rivers, and other waters where new information has become available. We also ask the Service to take a good, hard look at the long list of activities that threaten the continued existence of YCT across their current range (e.g. non-native fish stocking programs, dam operations, livestock grazing, oil and gas drilling, phosphate mining, floodplain development, etc.) and then determine whether current, on-the-ground conservation actions are adequately addressing these threats. We seriously questions whether they are. Thank you for considering our comments.

Sincerely,

Scott Bosse

Scott Bosse
Rivers Conservation Coordinator

Comment #18

Upper Shields Watershed Association
5242 Highway 89 South
Livingston, MT 59047

October 28, 2005

U.S. Fish and Wildlife Service
780 Creston Hatchery Road
Kalispell, MT 59901-8239

RE: Yellowstone Cutthroat Trout

To Whom It May Concern:

The Upper Shields Watershed Association (USWA) is a group of concerned citizens and landowners who are dedicated to conserving and restoring the agricultural heritage and natural resources in the upper Shields watershed. We acknowledge that Yellowstone cutthroat trout are a valuable resource in our watershed.

Our group was originally formed in 1997 as a response to a possible listing of the Yellowstone cutthroat trout at that time. A major objective of our Action Plan is to "Maintain or enhance existing and potential populations of Yellowstone Cutthroat Trout and other fish species in the Upper Shields River Watershed." Members of our group have educated themselves and other residents of the watershed as to methods to improve the habitat of the trout. We obtained funding for a Watershed Assessment which has guided our efforts since the beginning. We invited experts from many fields to help us both by speaking at our meetings and participating in our Technical Advisory Group. These experts include people from Montana State University Extension, NRCS, and DEQ among others. They include fisheries biologists, water quality experts, irrigation efficiency experts, and range management experts just to name a few.

For ten years, with the help of these experts, and using the Watershed Assessment as a guideline, the members of our watershed have directly addressed the issue of cutthroat trout habitat as well as issues more broadly affecting the riparian habitat and upland land use in our watershed. To cite a few actions taken, we have:

- Instituted many irrigation efficiency projects to help maintain instream flows.
- Put in place many off stream waterers for livestock.
- Installed buffer strips, installed many miles of fence to control grazing along the stream corridor.
- Obtained many grants to control noxious weeds and worked hard to educate residents.
- regarding the importance of controlling noxious weeds.
- Worked on Range Monitoring and Pasture Rotation.
- Obtained a large grant to address the TMDL issues in the watershed.
- Successfully undertaken numerous streambank stabilization projects.
- Worked closely with the fish biologists to do fish counts and improve habitat.

The last point is important as we have moved, with the help of Joel Tohtz (Montana Fish, Wildlife and Parks), Pat Byorth (Montana Fish, Wildlife and Parks), and other fish biologists, from anecdotal to scientific knowledge of the actual condition of the Yellowstone cutthroat trout in the Shields Watershed. The documentation I know they will provide you shows, without doubt, that the population is not endangered and is in fact healthy. Because of this it would be a waste of your time and money and, really, an insult to our watershed group to start all over again trying to list the Yellowstone cutthroat trout as endangered or threatened.

Further, the USWA is concerned with other implications of listing Yellowstone cutthroat trout as an endangered or threatened species. We work with a variety of state and federal agencies, who serve on our Technical Advisory Group. We feel that a relationship between local citizens and local representatives of state and federal agencies has been and will continue to be beneficial to the protection and of Yellowstone cutthroat trout. We feel that this relationship with our local agencies has been successful and as a locally-organized watershed group in partnership with our public servants that we can continue to be successful in keeping our Yellowstone cutthroat trout populations healthy and secure.

We feel that listing as a threatened or endangered species would disrupt our ability to conserve and restore cutthroat trout in our basin. Our locally-based partnerships have maintained strong populations of cutthroat trout in the Shields River and many of its tributaries. These efforts are successful because local citizens have ownership in the successes. In several recent local cases, (wolves, grizzly bears, etc.) federal mandates have made it difficult for local citizens to participate in or support conservation of endangered species. We feel that our community has been successful at conserving cutthroat trout and listing would be counter-productive in the future.

Sincerely,

Alan Johnstone
Chairman

CC: Patrick Byorth, MT Fish Wildlife & Parks
Gary Hoyem, Park CD Chairman

IDAHO MINING ASSOCIATION
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October 28, 2005

Yellowstone Cutthroat Comments
U.S. Fish and Wildlife Service
780 Creston Hatchery Road
Kalispell, Montana 59901–8239.

Sent by U.S. Post and Electronic Mail to: fw6_yellowstonecut@fws.gov

Attn: (*Oncorhynchus clarki bouvieri*)

Dear Sir or Madam:

These comments are submitted by the Idaho Mining Association ("IMA") in response to the invitation of the Fish and Wildlife Service ("FWS") to submit comments based on the best scientific and commercial information available for the FWS' status review of the Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*) ("YCT"). See 70 Fed. Reg. 52059 (September 1, 2005).

The IMA was founded in 1903 to further the interests of Idaho's mining industry and minerals production. The mission of IMA is to act as the unified voice for its members to ensure the long-term health and well being of Idaho's mining industry. The IMA has more than fifty members who meet throughout the state on a regular basis to ensure that mining remains a strong and responsible industry in Idaho's economic makeup. IMA encourages environmental responsibility and works on clean water issues, strong involvement with local communities, and preserving mining history.

IMA disagrees with the decision by Judge Figa in Center for Biological Diversity v. Morgenweck, 351 F.Supp.2d 1137 (D. Colo. 2004), compelling the FWS to complete a 12-month status review of the petition initially filed August 18, 1998, to list the YCT as threatened where it presently occurs in its historic range and to establish critical habitat for the YCT. IMA is concerned that Judge Figa's decision might lead FWS to reverse its 90-day finding declining to list the YCT as threatened. See 66 Fed. Reg. 11244 (February 23, 2001). IMA strongly supports the FWS' initial 90-day finding, and recommends, based on review of the best scientific and commercial information available, that FWS make the same substantive determination not to list the YCT as threatened. Indeed, even Judge Figa recognized that the same substantive result might ensue after the 12-month status review. See 351 F.Supp.2d at 1144.

IMA has reviewed the comments submitted regarding these YCT issues by the J.R. Simplot Company ("Simplot"). IMA hereby incorporates by this reference Simplot's comments, including the report of BioAnalysts, Inc. attached to and incorporated into the Simplot comments. BioAnalysts, Inc. is a firm that specializes in environmental issues affecting trout and salmon populations and that has served as technical analysts and advisors to industries, environmental groups, and government agencies.

IMA is concerned that a decision to reverse or modify the FWS' correctly made 90-day finding declining to list the YCT as threatened will conflict with the best scientific and commercial information available and create economic hardship for IMA members and already hard-pressed Idaho communities. IMA encourages FWS to affirm its initial 90-day finding declining to list the YCT as threatened in the upcoming 12-month status review.

Sincerely,

Jack Lyman
Executive Vice President